

PUBLIC WORKS

*city
county
and state*

March
1950

LEADERS IN THE PUBLIC WORKS FIELD



Edward Hyatt, for the past twenty-two years State Engineer of California, and for twenty-six years Chief of the Division of Water Rights of that State, has been a leader in the development of water resources in the west. His contributions in this field have been of benefit to the nation. A graduate of Stanford in 1912, he had been with the State of California for thirty-five years prior to his resignation from public life which became effective February 1.

*Some of the articles
in this issue:*

**90-inch Pipe Line Brings
Water to Denver**

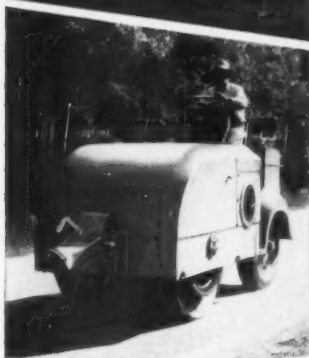
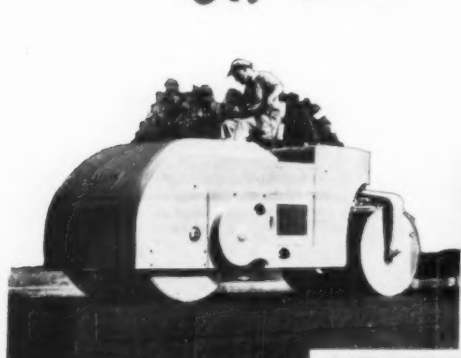
**How to Resurface Highways
with Concrete**

**Deep Outfalls for Sewage
and Sludge Disposal**

**Making Wood a Better
Engineering Material**

**Bottle Creek Streamlines
for More Public Works**

**FOR SIDE STREET
OR SUPER HIGHWAY—**



**GALION ROLLERS
DO A BETTER JOB**

GALION is the world's largest manufacturer of rollers — a position achieved thru superiority in design, construction, and performance.

TANDEM

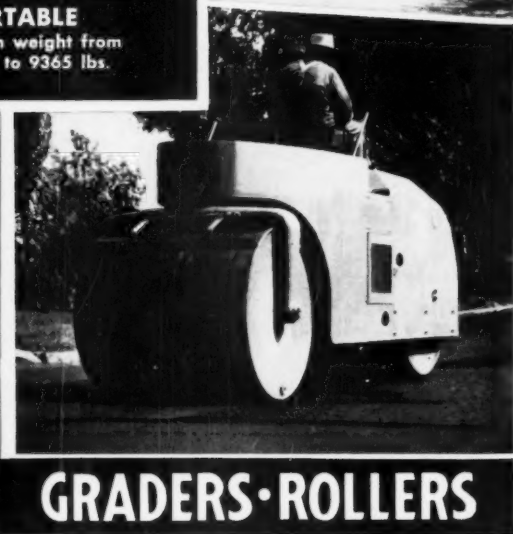
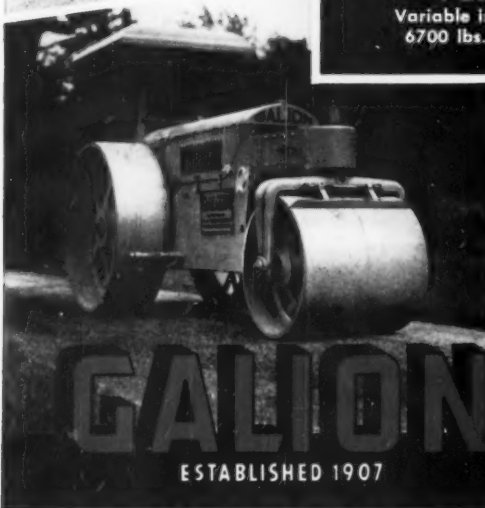
3-5-8 and 10 ton sizes
Variable weight from 3 to 14 tons

THREE-WHEEL

6-7-8-10 and 12 ton sizes

PORTABLE

Variable in weight from
6700 lbs. to 9365 lbs.



GALION

ESTABLISHED 1907

GRADERS • ROLLERS

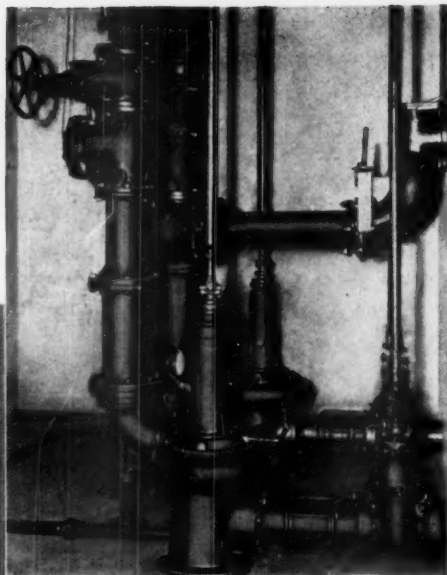
THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address: GALIONIRON, Galion, Ohio

CLOG-PROOF
•
RELIABLE

There's no substitute for
The "Chicago"

FLUSH-KLEEN

Sewage Ejector of Proved Performance



"Flush-Kleens" are absolutely clog-proof . . . the impellers handle nothing but strained sewage, minimizing wear and maintaining pump balance. They need no manual attention other than lubrication and inspection. No labor is needed to dis-assemble and clean. Not just another practically non-clog pump—"Flush-Kleens" are *positively* clog-proof.

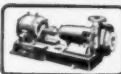
Look at These Long-established Facts

- "Flush-Kleens" are the only absolutely clog-proof sewage pumps; impellers are not required to pass any solids.
- The "Flush-Kleen" will pump anything that will pass through the pipe regardless of type or quantity of material.
- "Flush-Kleen" selection is not limited to a narrow pumping range to prevent dynamic unbalance of the impeller and consequent shaft and bearing failure.
- "Flush-Kleen" versatility and flexibility of operation make selection of the proper unit simple for small stations where accurate capacity and head figures are often not available.

CHICAGO PUMP COMPANY
SEWAGE EQUIPMENT DIVISION

2348 WOLFRAM STREET

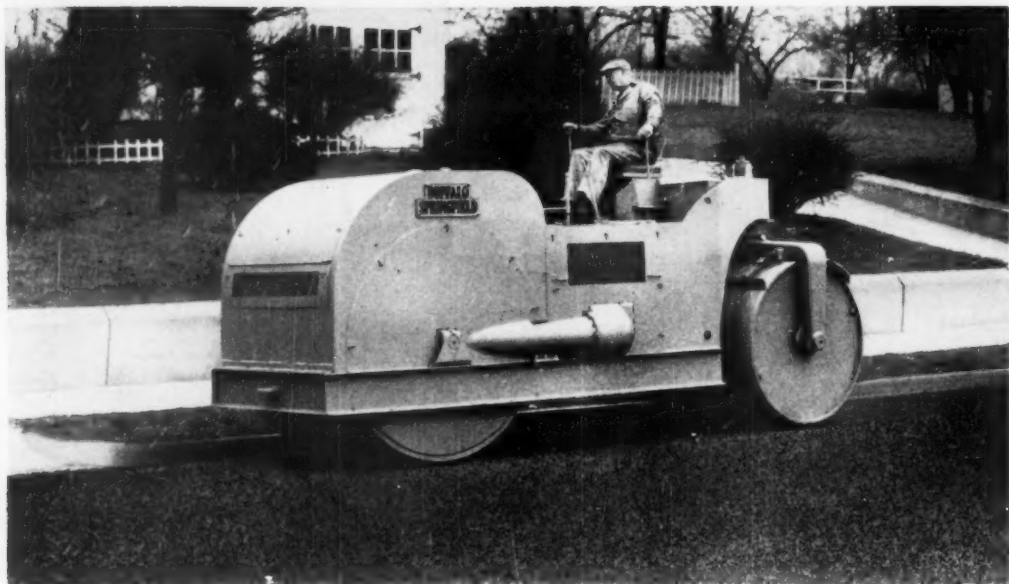
Flush Kleen, Scrub-Peller, Plunger,
Horizontal and Vertical Non-Clogs
Water Seal Pumping Units, Samplers.



CHICAGO 18, ILLINOIS

Swing Diffusers, Stationary Diffusers,
Mechanical Aerators, Combination
Aerator-Clarifiers, Comminutors

Write for further
information and
test data on Chi-
cago Pump Com-
pany "Flush-
Kleen" Sewage
Ejectors.



How to smooth out your... BUDGET PROBLEM

When a roller purchase is made, two important variables always come into balance—(1) job requirements of the equipment, and (2) expenditure limitations of the purchaser's budget.

Sometimes, job or performance requirements come first, and initial product cost is secondary. At other times, initial cost must come first. The final selection is easier if quality of product is available over a wide price range. That's why Buffalo-Springfield has added a new series of Standard Tandems to its famous Heavy Duty* Tandem line.

These new units—reflecting the quality of manufacture and design always associated with Buffalo-

Springfield—have been built for long-term dependable performance and lowest-cost operation. Where job requirements are not unusual, or initial cost is the controlling factor, the Standard Tandem is recommended. For wide job versatility and extra ruggedness to meet the most severe operating conditions, the Heavy Duty Tandem remains in a class by itself. Compare *either* line with any other rollers made. You will find Standard Tandem better—the Heavy Duty Tandem best.

Ask your Buffalo-Springfield distributor to help you solve your budget vs. performance problem—by suggesting the model that best meets *both* these requirements.

MAIL THIS COUPON TODAY

THE BUFFALO-SPRINGFIELD ROLLER CO.
Dept. G-3, Springfield, Ohio

- ☐ Please send me Catalogue 5-57-49 describing the right model for my requirements.
- ☐ Notify Distributor to call.

NAME

ADDRESS

CITY STATE

BUFFALO  **SPRINGFIELD**
SPRINGFIELD, OHIO

PUBLIC WORKS JOURNAL CORP.
310 East 45th St., New York 17, N.Y.

Officers

W. A. Hardenbergh, *President*
Croxtton Morris, *Vice Pres & Treas.*
A. Prescott Folwell, *Secretary*

Editors

A. Prescott Folwell
W. A. Hardenbergh

Assistant Editor

Edward B. Rodie

Editorial Assistant

Helen E. Quinn

General Manager

Croxtton Morris

Art Consultant

Nathaniel Pousette-Dart

Advertising Manager

Arthur K. Akers

Production Supervisor

I. James Barger

Circulation Supervisor

Edward B. Rodie

Advertising Offices

New York 17, 310 East 45th St.
Arthur K. Akers, *Adv. Mgr.*
Burton M. Yost

Chicago 11, Ill.,
612 N. Michigan Ave.
Lewis C. Morris, *Western Mgr.*

Cleveland 10, Ohio, Villa Beach 2,
15445 Lake Shore Blvd.
Robert J. Shea, *Mgr.*

Dallas 6, Texas, 5241 Bonita Ave.
Francis J. Burt

Los Angeles 14, Calif.,
Halliburton Bldg., Suite 318
Simpson-Reilly, Ltd.

San Francisco 3, Calif.
Central Tower, Suite 814
Simpson-Reilly, Ltd.

Seattle 4, Wash.
New World Life Bldg.
Simpson-Reilly, Ltd.



Public Works T. M. Reg. U.S. Pat. Off.

Public Works is published monthly by Public Works Journal Corp. Editorial and advertising offices are at 310 East 45th St., New York 17, N. Y. Subscription rates: USA and possessions, \$3. All other countries, \$4. Single copies 35¢ each, except special issues which are \$1.

Copyright 1950 by
Public Works Journal Corp.



Public Works

**THE ENGINEERING AUTHORITY
IN THE CITY-COUNTY FIELD**

Edited by
W. A. HARDENBERGH and A. PRESCOTT FOLWELL

CONTENTS FOR MARCH, 1950

How a Planned Public Works Program Benefits a City. By R. R. McIntosh	27
Deep Outfalls for Sewage and Sludge Disposal. By A. R. MacPherson	30
90-Inch Pipe Line Brings Water to Denver	32
Jeep and Snow Plow Cleans Outdoor Ice Rink. By N. W. Nester	34
Heavy Equipment is Working on the Levee	35
Concrete Resurfacing — New Pavements for Old. By J. F. Cooke	36
Diesel Engines Save \$20,000 a Year on Fuel	39
Building a Concrete Reservoir with Sectional Forms. By Jack Wegweiser	40
Making Wood a Better Engineering Material. By John G. Hammond	42
How Storm and Sanitary Sewer Problems Were Solved. By A. J. Richardson	44
Mapping Construction Materials. By F. E. Byrne	65
New Equipment Saves Money for Superior. By Wm. J. Deegan	74

PUBLIC WORKS DIGESTS

The Water Works Digest	55
The Highway and Airport Digest	61
The Sewerage and Refuse Digest	67

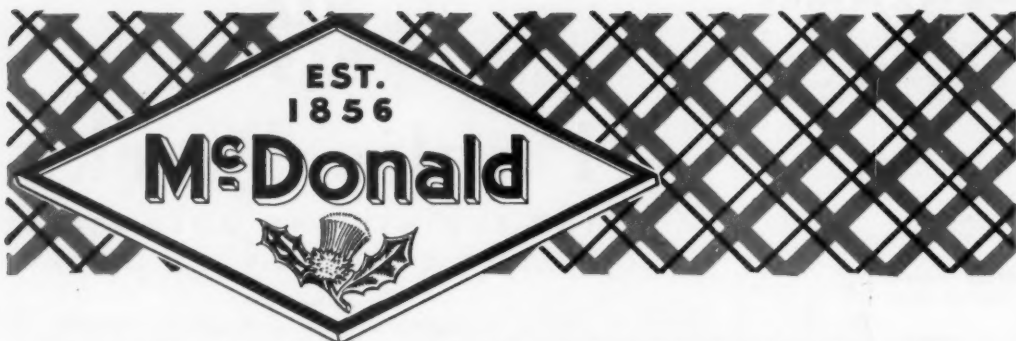
PUBLIC WORKS ENGINEERING DATA

Maintenance Cost Breakdown	52
Costs — Fourth Quarter of 1949	52
Reducing Water Consumption in England	52
Salvaging Old Pavements by Resurfacing	53
What Are Electric, Engine and Boiler Horsepower? By W. F. Schaphorst	53
Protecting a Sewer Outfall	53
Garaging and Off-Street Parking Requirements	65
Municipal Power Plant Makes Profit	66
Testing Highway Axle Weight Effects	66
New Process for Treating Beet Sugar Wastes	66
How to Paint a Swimming Pool	72
Sanitary Fill at Rapid City, S. D.	73
Water Use in St. Paul	73
Cost of Collecting and Incinerating Refuse	73
Finding Pipes Quickly	73
Garbage Collections Cease; Garbage Grinders to be Installed	73
Industrial Waste Data — A Correction	79
Skid Resistance Better on Rubber-Containing Pavements	79

DEPARTMENTS AND SECTIONS

Leaders in Public Works ... Front Cover	New Public Works Equipment 80
The Editor's Page 7	Conventions and Meetings 83
Letters to The Editor 19	The Engineer's Library 85
Books in Brief 20	Worth Telling 90

The 1950 volume of *Public Works* will be available on microfilm through University Microfilms, 313 N. First St., Ann Arbor, Mich.



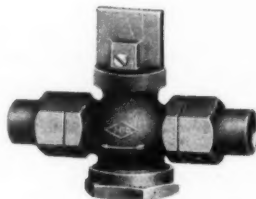
McDONALD CRAFTSMANSHIP in waterworks brass ... pays off in true economy

McDonald "Diamond Line" curb and corporation stops are smooth in operation, dependable in service. They are precision made from 85-5-5 metals with every step from foundry to final inspection and testing under rigid control. Ground keys fit close for perfect sealing, yet turn easily for trouble-free servicing... clean threads mean easier, faster installation... full waterways assure maximum flow.

For real economy in waterworks brass, for items designed to stay on the job and keep maintenance costs low, specify McDonald—for 94 years only the best. Write for literature and prices.



E-4701
Corporation Stop.



E-4713
Combined cap and tee handle inverted key curb stop for copper pipe, both ends.



E-4727
Curb Stop for copper service pipe. Minneapolis pattern. Solid brass tee handle.



E-4711
Combined cap and tee handle inverted key curb stop. Inlet copper pipe, outlet iron pipe thread.

A. Y. McDONALD MFG. CO.
DUBUQUE, IOWA
BRASS GOODS • PUMPS • OIL EQUIPMENT

THE EDITOR'S PAGE

"A Poor Job of Maintenance"

IN GOING over, in some detail, the reports of many hundred counties in regard to road work, one cannot fail to be impressed by the high quality of engineering skill that so many counties are now utilizing. Nor can the student of these reports fail to be impressed by the wastage of road funds in those counties where there is no engineer in charge of the work. A typical case is a report from a mid-west county: This county does almost no construction. The road monies are allotted to and spent by the various commissioners, each in his own district, and it all goes for a poor job of maintenance. We have been hoping to get a decent road program started with a county engineer in charge, but we have made little progress.

No doubt we are prejudiced in favor of engineers, even though we criticize them mildly at times; but we know that a good engineer can save money on both construction and maintenance. He can do a job that the average office-holder, lacking previous experience in what an engineer can do, cannot even visualize.

If you want a job well-done, get a man qualified in that line of work to do it—the best man you can get. For road building and maintenance, that means an engineer. He has the experience, so necessary for this work, in planning, organizing and handling men and machinery. So far as we are concerned, no other need apply.

Better Military Usage of Engineers

THE secondary wave of articles describing wartime experiences is now reaching editors. These generally are articles of real merit based on careful consideration of many factors and notably free of anger and snap judgments. A recent typical one to this office describes what happened at one army post where good engineering skills were lacking. Granted shortages of materials and the need for speeding up construction, there was still poor engineering and too much of it. We know that the same conditions existed at many other installations. Rather than to find excuses for this poor work, we should see what can be done to eliminate the need for excuses in the future.

It is not necessary to emphasize that in another emergency we cannot afford to do things in the same old inefficient way. Your editor saw the unfolding of our war construction program and he felt then, as he does now, that many of these mistakes should have been avoided. A sound plan can be worked out which will accomplish this.

If proposed changes in the Army reorganization bill are incorporated into law, it will be the first time, we believe, that statutory recognition is given to the need for qualified engineering and other professional skills in the Army. These provisions can furnish a basis for a better use of such skills and we believe

that a program can be worked out for the actual accomplishment of this objective. It will take time to do this, but the work will be justified by the huge savings in man-hours, material and time that will be possible in an emergency.

Speaking now of engineers, several essentials appear to be needed. The first one should be a cataloging of the skills of engineer reserve officers and the classifying of these by something better than the old MOS number system into recognized engineering groups and subgroups. There will be difficulties in such a classification, but none seems serious.

As a second step it will be necessary to determine about how many engineers of each category of skill will be required for each step in preparation and mobilization, including pre-mobilization construction. This should not be a very difficult job.

A third step should be a review of reserve officer qualifications and the establishment of a priority status for call to active duty. This status should be based on the need for particular skills as determined by the mobilization program. For instance, the engineers required for pre-mobilization construction would have a high priority and these men should be chosen beforehand for their skills in this kind of work.

This program looks like a lot of work, but it isn't as bad as it sounds to the uninitiated. It will save time, which we have little of in war, and it will do much to reduce wastage of personnel, material and money if an emergency comes. It must, of course, be kept up to date—not a large job. Properly done it will help to assure that well-trained men are utilized for work in the fields in which they are best qualified.

Progress in the South

FLORIDA, somewhat embarrassed, perhaps, by an article in a national magazine some time since, which described existing sanitary conditions—or the lack of them—has actually made distinct, if not outstanding, progress in waste disposal and pollution abatement. A report from the State Health Department lists 108 disposal projects that have been approved during the past three years—77 have been built or are building. In addition, much other work has been carried on.

One of your editors visited Florida late last fall; another is there now (it makes editing so much simpler when work and pleasure can be made to coincide). They have seen this new spirit moving ahead under the leadership of Dave Lee, chief sanitary engineer of the state. Down at the University, with Earle Phelps as the presiding genius and John Kiker the driving force, a program of research in waste treatment is under way—a program based on realism and unfettered by too much tradition. At Daytona Beach is a new type of sewage treatment that promises much. These are but samples, but they show how strong is the trend to progress in Florida.

LOW in Cost... BIG in Performance

NEW

ALLIS-CHALMERS

MODEL

D

WEIGHT — 8,500 lbs.

BRAKE HP. — 34.7 (famous
Allis-Chalmers gasoline engine)

SPEEDS — four forward, 2.40 to
18.61 m. p. h.; reverse to 2.37



BUILDS AND CLEANS DITCHES



SLOPES BANKS—UP TO 2:1



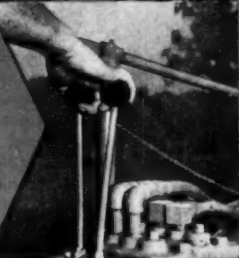
LEVELS SUB-GRADE; ideal for finishing

**ALL-VIEW
CAB**
lifted off
or replaced
in a jiffy.



**HYDRAULIC
BLADE LIFT**

... finger-play
control—fast,
positive, trouble-
free. Blade angle
set from
platform.

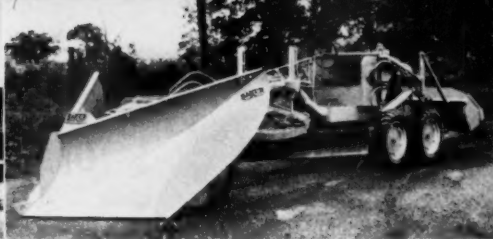




HYDRAULIC SCARIFIER—does a surprising job ...rear-end weight keeps teeth ripping uniformly, at desired depth—smooth, positive steering.



LOADS MATERIAL into trucks with Tractomotive Loader—from windrows and stockpiles...surplus dirt or snow.



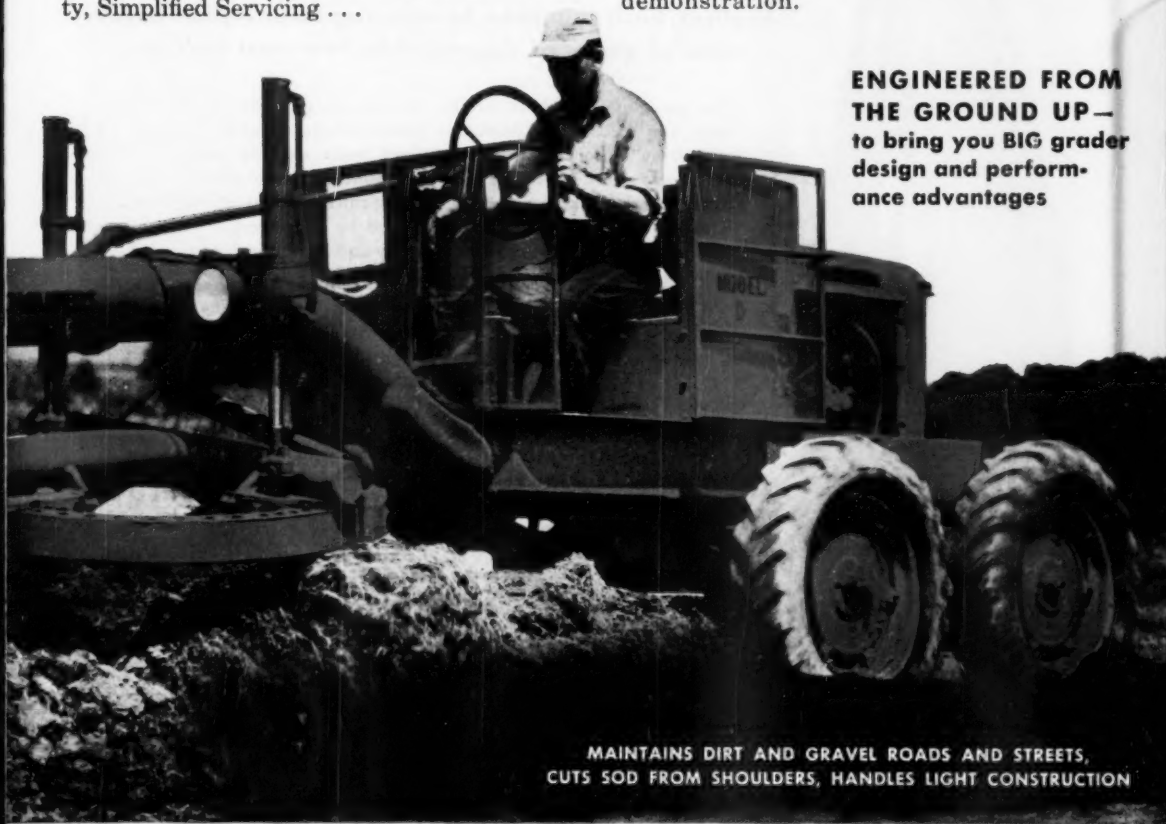
PLOWS SNOW with specially designed Baker snowplow (backfills with interchangeable blade).

One-third the price of large motor graders

Yet has many big grader features — Tandem Drive, "Roll-Away" Moldboard, Tubular Frame, Hydraulic Blade Lift, Engine Over Drive Wheels, Drop Down Transmission, High Throat Clearance, Complete Operator Comfort, Full Visibility, Simplified Servicing . . .

. . . Plus special attachments that widen its usefulness — Rear-End Loader, Scarifier, V-Type Snowplow with interchangeable blade for backfilling and light 'dozer work. Also various other accessories.

Ask your Allis-Chalmers dealer for a demonstration.



ENGINEERED FROM THE GROUND UP—
to bring you **BIG** grader design and performance advantages

MAINTAINS DIRT AND GRAVEL ROADS AND STREETS,
CUTS SOD FROM SHOULDERS, HANDLES LIGHT CONSTRUCTION

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



Only A. O. Smith gives you **ONE** source of **UNDIVIDED** **RESPONSIBILITY**

with **SMITHway** Vertical Turbine Pumps

All major pump parts of A.O. Smith Pumps are designed together, built together, to work together—your assurance of years of dependable, low-cost service.

When you choose an A. O. Smith Pump, you know it is *all* A. O. Smith from motor to strainer—SMITHway all the way down. You can be sure that the sum of A. O. Smith's 76 years of experience has been engineered into *every* pump part, to give you a superiority you can depend on under the toughest operating conditions.

Weight Where Weight Belongs.

A. O. Smith discharge-head assemblies are built of heavy steel plate, formed and welded into the strongest, most compact design. Support for the driver and suspended assemblies is rigid, vibrationless, yet easily accessible.

Bowls are precision-machined from hard, close-grained cast iron, fitted with smooth, streamlined diffusion vanes contoured for maximum efficiency. Bronze impellers, closed or semi-open, are dynamically and hydraulically balanced.

"Tailor-Made" for Each Job.

Complete interchangeability of major assemblies lets you select the right combination of driver, column pipe, lubrication, and impeller to fit each pumping application. You have an application-engineered pump exactly right for each job.

Send the coupon for complete information!

CERTAIN DISTRIBUTOR TERRITORIES for SMITHway Pumps are still available. Write for full details telling you all about the SMITHway Vertical Turbine Pump franchise. Send the coupon below for our colorful descriptive bulletin.

A.O. Smith

VERTICAL TURBINE PUMPS

Atlanta 3 • Chicago 4 • Houston 2 • Los Angeles 14
Dallas 1 • New York 17 • Midland 5, Texas
Philadelphia 3 • Seattle 1 • San Francisco 4
Pittsburgh 19 • Tulsa 3

International Division: Milwaukee 1

A. O. Smith Corporation, Dept. PW-350
Milwaukee 1, Wisconsin

Without obligation, send us your illustrated descriptive bulletin on Smithway Vertical Turbine Pumps.

Name

Street or Route Box

City State

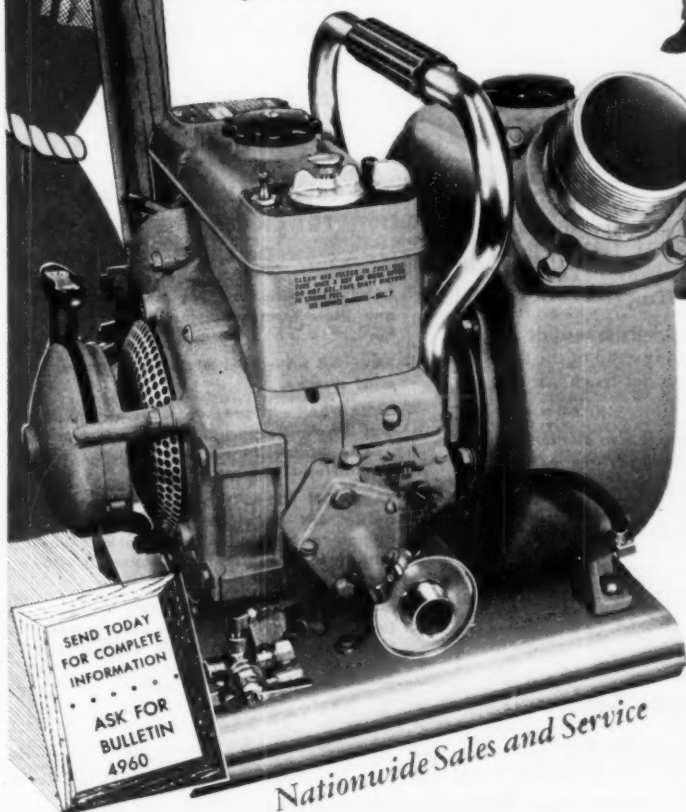
McCULLOCH

presents

THE LIGHTEST 15,000 GPH PUMP

*engine and pump together
weigh only 57 pounds*

Self-priming centrifugal pump with output of 15,000 gallons per hour, 250 gallons per minute, 28-foot suction lift; 3-inch outlet and inlet. Special gasoline engine develops 5 hp; automatic governor control of speed at all loads.



SEND TODAY
FOR COMPLETE
INFORMATION

ASK FOR
BULLETIN
4960

Nationwide Sales and Service

This remarkable new engine-driven pump is another achievement of the same engineering that produced the McCulloch line of chain saws

McCULLOCH MOTORS
CORPORATION

LOS ANGELES 45, CALIFORNIA
Export Department, 301 Clay Street
San Francisco 11, California, U. S. A.

When writing, we will appreciate your mentioning PUBLIC WORKS



This 145-horsepower Series F-7 Ford Truck has a Gross Vehicle Weight rating of 19,000 lbs.

"We've cut sand hauling costs 30% with our Series F-7 Ford Truck"—SAYS F. M. LeGATE, Jr.

JACKSONVILLE SAND CO.
JACKSONVILLE, FLA.

"We were faced with mounting hauling costs because of increasing length of haul and greater traffic congestion," reports F. M. LeGate, Jr. of the Jacksonville Sand Company. "Then we changed to a series F-7 Ford Truck.

"This new 145-horsepower Ford has done the job. Hauling six yards of sand instead of the four yards hauled by our older model trucks, it has cut our cost per yard by 30%."

In any line of business, *Ford Trucks do more per dollar!* They go easy on expense for gas, oil and repairs. They're strong on work output. Ford Trucks are built with big reserves of strength and power to handle big loads at low cost.

Let your Ford Dealer show you which one of over 175 models is the one right truck for your job.

HERE'S WHY AMERICA'S NO. 1 TRUCK VALUE WILL DO MORE PER DOLLAR FOR YOU!

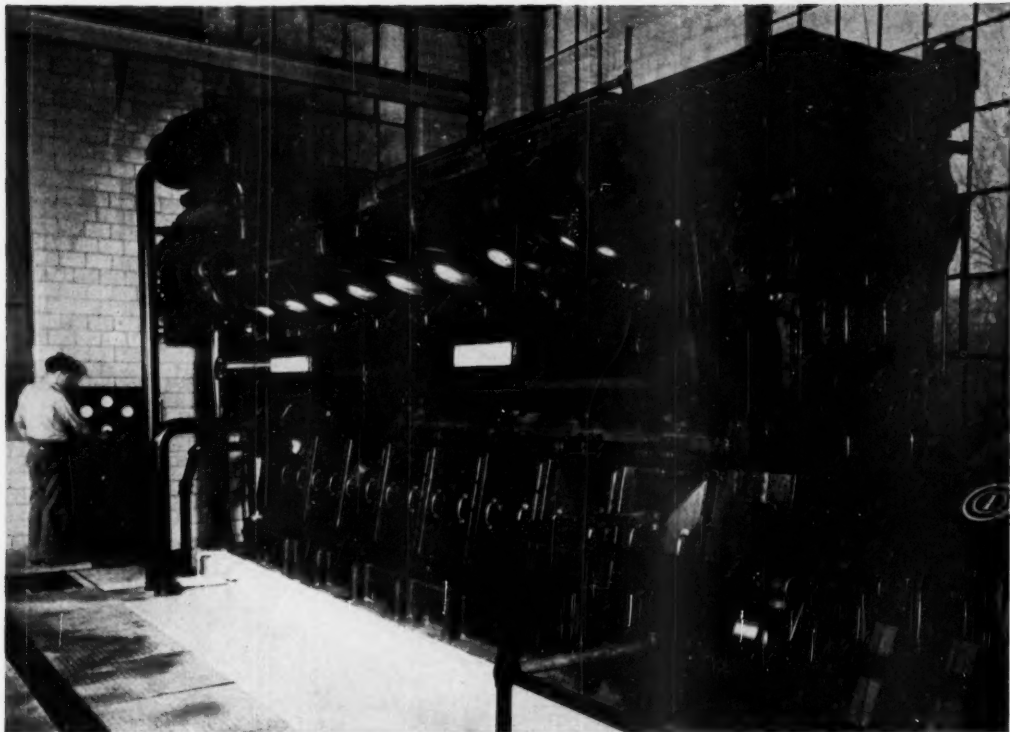
- **SAVE GAS** with Ford Loadomatic Ignition and High Turbulence combustion chambers.
- **SAVE OIL** with Ford Flightlight aluminum alloy pistons.
- **SAVE WEAR** with pressure lubricated main and crankpin bearings, Double Channel frame, extra heavy duty axles, big brakes (up to 16-in. x 5-in.).
- **SAVE ON REPAIRS** with demountable brake drums, brake inspection hole, engine-top setting of accessories, plus nationwide service from over 6,400 Ford Dealers.
- **SAVE TIME** with Ford reliability and performance. Up to 145 horsepower. Only Ford gives you a choice of V-8 or Six!

Ford Trucks Cost Less Because -

FORD TRUCKS LAST LONGER

Using latest registration data on 6,106,000 trucks, life insurance experts prove Ford Trucks last longer!

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.



FROM RED TO BLACK IN A HURRY

● Soaring costs and rising peak demands caused an Ohio generating plant to operate in the red. The management decided to do something about it—and they did. They looked over the engine field . . . bought a supercharged Superior Diesel . . . and put it to work. After installation, over-all plant capacity was stepped-up almost 17% per gallon of fuel oil. This Model 80 Superior Engine also produced more BHP per gallon of lube oil . . . more than doubling the economy experienced

in previous operations. The profit and loss statement changed from red to over \$34,000 in the black in just ten months.

If you are looking for ways to cut power costs, chances are that a Superior representative can supply the answer. Why not have him explain how Superior pushes operating costs down? Or, if you prefer, write for our fully illustrated, 20-page booklet.

THE NATIONAL SUPPLY COMPANY SUPERIOR ENGINE DIVISION

Plant and General Sales Office: Springfield, Ohio

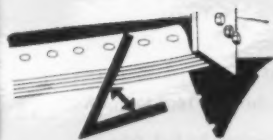


Superior
DIESELS

Locomotive • Marine • Oil Field • Stationary

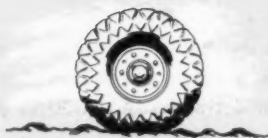
When writing, we will appreciate your mentioning PUBLIC WORKS

BOOST PRODUCTION



EASY LOADING

Blade angle and design are two points that contribute to good or bad loading characteristics. The tough "Caterpillar" blade is set to shear hard-to-dig material, then direct and guide it into the loading chute. With 3 inches of special hard facing alloy deposited on these cutting edges, the user is assured of a blade that sharpens to a keen edge.



BIG TIRES . . . MORE TRIPS

When ground conditions deteriorate, air pressures are usually reduced to keep tire penetration at a minimum. The big and oversize tires used on "Caterpillar" Scrapers are able to have their pressures greatly reduced without overloading. That means they stay on top, roll more easily, allow hauling in higher gears and aid in piling up real yardage records.



'DOZER-TYPE EJECTION

'Dozer-type ejection rolls sticky clay out of the bowl with ease and precision. Typical of "Caterpillar" finely engineered design are the ejector plate guide rollers. These heat-treated rollers are mounted on adjustable eccentric shafts so that proper clearance may always be maintained between bowl sides and ejector plate. Binding or rubbing problems are eliminated.

CATERPILLAR

REG. U. S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS

AND CUT COSTS

with
"CATERPILLAR"
SCRAPERS

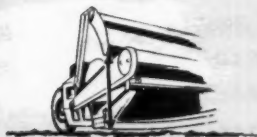
WHEN the chips are down, you can count on a husky "Caterpillar" Scraper to come through for you. Stamina is built into every inch of its hide to stand terrific punishment. Its finely engineered design enables it to speed through jobs that slow down ordinary units. Pair it with its matching "Caterpillar" Diesel Tractor, and you've got a team that saves you money two ways—in higher production and lower maintenance costs.

Pictured here is a "Caterpillar" No. 80 Scraper rated at 18 heaped yards with its matching D8. Owned by Eau Claire County,

Wisconsin, this team pays dividends every pay load. Making a trip every 7½ minutes on an 1800-foot round-trip haul, its average production is about 800 bank measure cubic yards per 8-hour day.

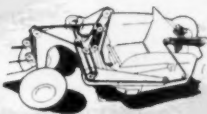
You can't talk quality into a machine. You've got to build it in—take a look at the "Caterpillar" Scraper's features and you'll see why this big yellow slugger really rates with men who know earthmoving. Better still, call your nearby "Caterpillar" dealer today for information and a demonstration!

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



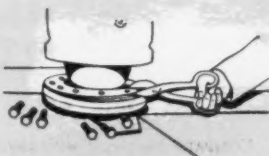
GOOD APRON DESIGN

"The sky is the limit" when raising the aprons on "Caterpillar" Scrapers. Open-top scraper design combined with long apron arms located outside the bowl assure the free ejection of heaping sticky loads. When ejecting fine materials such as sand, the maximum apron height can be reduced to provide a smooth spread with no gaps.



ENGINEERED CABLE SYSTEM

The entire "Caterpillar" cable control system is finely engineered to give constant easy performance. Accurately aligned heat-treated sheaves prevent cable chafing and minimize power drain on the tractor engine. All cables are shielded against abrasive materials, yet one man can easily thread the entire unit while keeping both feet on the ground.



LOW MAINTENANCE COST

Typical of "Caterpillar" in-built quality is the ball and socket joint connecting gooseneck to front axle. The ball is induction hardened with a tough center to withstand both wear and breakage. Spherical design enables the scraper to be maneuvered into extreme positions without binding. Shims are removed as wear occurs and a bronze liner rides between ball and socket to prevent steel-to-steel contact. Lubrication is through a single Zerk fitting.

DIESEL

EARTHMOVING EQUIPMENT



CATERPILLAR TRACTOR CO.
Box PW-3, Peoria, Illinois

Send me, without obligation, booklet,
"Caterpillar" Scrapers Are Profit Makers."

Name _____

Address _____

MOTOROLA "RESEARCH" LINE OF F.M. 2-WAY RADIO

Chosen again

and again by city after city for
superior adjacent channel performance

TYPICAL REPORT: "In compliance with test requirements, Motorola Inc., installed three 250-watt fixed station transmitters (on 155.73 mc.; 155.79 mc.; 155.85 mc.). The Motorola mobile equipment selected the 155.73 mc. station in all conditions with good results. No reception of the adjacent channel station was noted even when the mobile unit was operated in the immediate vicinity of the other transmitter."

"RESEARCH" LINE OF F.M. 2-WAY RADIO

with revolutionary new developments engineered at Motorola—the World's largest laboratories devoted exclusively to the development of radio communications systems—specialists in this field for over twenty years.

COMPARE Motorola with any other equipment. Write today for complete details.

protection

... of your long-term investment. PROTECTION against obsolescence for many years to come.

Specify Motorola "Research" Line for permanence in FM 2-way radio operation.

GOOD
POLICY



Motorola

Communications & Electronics Division • 4345 W. AUGUSTA BLVD. • CHICAGO

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.



REPORT (CONTINUED)

"These tests preclude and safeguard us against future possibility of interference from any other transmitters that may be set up."

"Car to car tests exceeded all reasonable demands for car to car operation in emergency services."

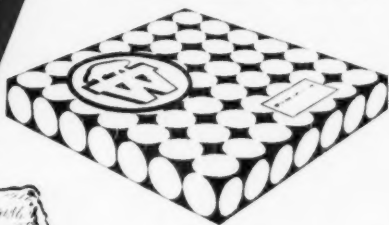
"Collectively the tests have proven that Motorola equipment will amply provide for a modern communications system for our fire and police departments, not only at the present but in the future."

Consider these Advantages

...when buying copper water tube

Wolverine tube is

available in step coil form—one continuous tube 60 feet long in two coils, one of which fits inside the other. It is soft throughout its entire length. Easy to bend. Easy to flare. Sizes within close tolerances.

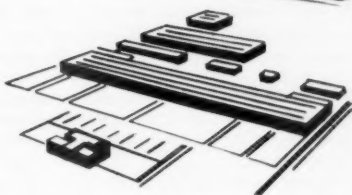
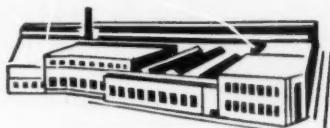


Wolverine tube is

individually cartoned. Easy to handle. Easy to stock and inventory. Easy to buy and sell. Easy to reship. Always protected against damage.

Wolverine tube is

manufactured by a division of the country's oldest producer of copper—Calumet & Hecla Consolidated Copper Company—backed by over a quarter-century of manufacturing of non-ferrous seamless tube exclusively—with strict adherence to quality-control from ore to finished product—produced in two great plants, one recognized as the world's most modern.



WOLVERINE TUBE DIVISION

CALUMET AND HECLA CONSOLIDATED COPPER COMPANY

MANUFACTURERS OF SEAMLESS NON-FERROUS TUBING

1451 CENTRAL AVENUE

DETROIT 9, MICHIGAN

Plants at Detroit and Decatur, Ala.



Buy From Your Wholesaler

When writing, we will appreciate your mentioning PUBLIC WORKS

Let's look at the record!



TAKE 1949
FOR EXAMPLE

In 1949, Lock Joint Pipe Company supplied or contracted to supply reinforced concrete pressure pipe in 75 cities and towns throughout the western hemisphere. Completion of these contracts requires production of the equivalent of more than 75,000,000 inch diameter feet of pipe varying in size from 12" to 120" and designed for pressures varying from a minimum to better than 200 pounds per square inch.

In 1949, Lock Joint Pipe Company provided pressure pipe for installations from Portland, Maine, to Rio de Janeiro,

Brazil—from Denver, Colorado, to Ciudad Trujillo in the Dominican Republic. And if past performance is any criterion, every installation will produce another "satisfied customer."

We will gladly refer you to any or all of the many federal agencies, state or county authorities, private water supply companies and industrial concerns which have installed Lock Joint Pressure Pipe during the last forty years. We are confident that their testimony will prove to be Lock Joint's best salesman.

For over forty years Lock Joint has specialized exclusively in the production and technical improvement of reinforced concrete pipe for water supply and distribution mains, sewers, storm drains, culverts and subaqueous installations.

LOCK JOINT PIPE COMPANY

Est. 1905

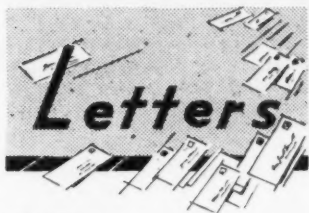
P.O. Box 249, East Orange, N. J.

PRESSURE PIPE PLANTS: Wharton, N. J.; Turner, Kan.; Detroit, Mich.

BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col.
Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill.
Wichita, Kan. • Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex.
Oklahoma City, Okla. • Tulsa, Okla. • Hato Rey, Puerto Rico

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.



THANKS, ROLF

The article by John Dawson in the January, 1950, issue of PUBLIC WORKS interested me very much. In addition to the valuable information in the text of the article, I was impressed by the excellent method of illustrating the equipment and the graphical presentation of the experimental results. I know that considerable effort was expended in the preparation of these illustrations but the effort was well rewarded by the net effect on the paper.

I note that the same care was exercised in illustrating other articles published in that issue. I trust that this same policy can be continued because it makes for much more interesting reading as well as more complete understanding of the points presented by the authors.

Congratulations are indeed in order to you and your editorial staff for the very successful job of face-lifting you have accomplished. When I look back at the issues of two years ago, I find it difficult to realize that PUBLIC WORKS is the same magazine.

Rolf Eliassen,
Professor of Sanitary
Engineering,
Massachusetts Institute of
Technology.

INDUSTRIAL WASTE DATA

There is an error in the article "Industrial Waste Data" which appeared in the October, 1949, issue of PUBLIC WORKS. In the section concerning milk and creamery wastes, it is stated: "Volume and strength of milk waste per 100 pounds of milk intake daily is . . ." Upon checking the figures given with those in Appendix 8 of Supplement D of the report of the U. S. Public Health Service of its study of the industrial wastes in the Ohio River Basin, we find that the figures given in your article should be based on 1,000 pounds of milk received daily, and not 100 pounds. Therefore the article should read: "Vol-



TWO NEW R-C BULLETINS

for smaller volume, moderate pressure applications

If you are handling gas or air for any of the purposes listed below, or for similar applications, you need these two new bulletins on R-C Rotary Positive AF Blowers and XA Gas Pumps.

1. Air for combustion with oil or gas burners, small cupolas, coke-fired forges, etc., in:

Iron and steel works	Asphalt heaters
Food processing industries	Smelters
Neon sign shops	Oil-fired forges
Chemical processes	Bakeries
Nonferrous foundries	Ceramic, brick and tile mills

2. Aerating and agitating liquids, in:

Ice plants	Water treatment
Sewage and industrial waste disposal	Protecting dams from ice
Electroplating, engraving and electrotyping	Fruit, vegetable and poultry washing and cooling
Fish tanks or trucks, also shallow lakes	Blending vinegar, fruit juices, etc.
Oyster washing	Compounding oils

3. Miscellaneous pressure or suction uses:

Pneumatic conveying of grains, insulation and liquids	Drying barrels and drums
Rock dusting in mines	Blowing cake off filters
Dust collecting systems	Air seal for bearings of rock crushers, etc.
Low pressure sandblast	Pneumatically controlled valves
Respirators and safety helmets	Steam garment presses
Testing rubber balloons, etc.	Printing presses
Cleaning forging dies, motors and machines	Paper folding machines
Boosting inlet pressure of compressors	Vacuum chucks
	Drying yarns, textiles, etc.

4. Gas Pumps for:

Boosting fuel supply to industrial furnaces	Gas sampling equipment
Chemical processes and refineries	Inert gas generators
Boosting pressure from small gas wells	Exhausting oil vapors
Neon sign shops	CO ₂ collectors
	Boosting supply to gas engines

These bulletins bring you up to date on construction, capacities, regulation, control and other details on R-C Type AF Blowers (Bulletin 21-B-37) and Type XA Gas Pumps (Bulletin 31-B-17). Send for them or write us about your needs, for engineering analysis, without obligation.

ROOTS-CONNERSVILLE BLOWER CORPORATION
503 Poplar Avenue, Connorsville, Indiana

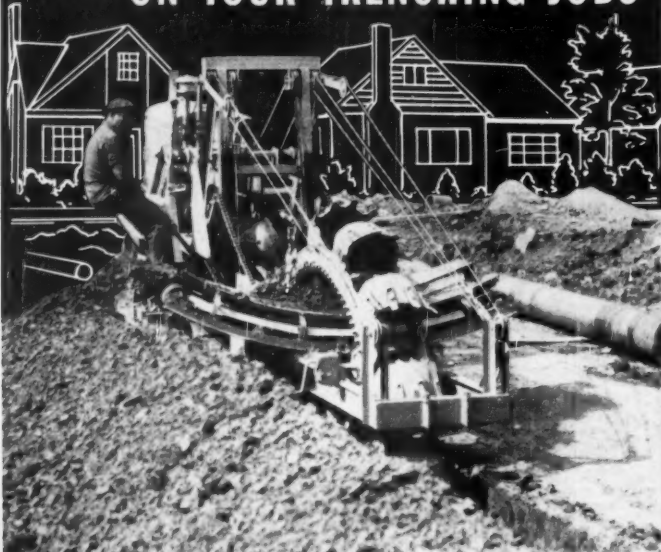


When writing, we will appreciate your mentioning PUBLIC WORKS

CLEVELANDS

CONSTRUCTION & ENGINEERING

GIVE *Top Performance* ON YOUR TRENCHING JOBS



Wherever—whenever—whatever the trenching job—in the confined areas of city or suburb—across the wide open country—over rough, rugged terrain—through sticky gumbo, rocky ground or sandy soil—in the intense summer heat or cold stormy weather—CLEVELANDS have delivered outstanding performance on thousands of projects for more than a quarter of a century.

And the reason why you can always depend on CLEVELANDS for the maximum trench yardage obtainable, no matter what the conditions, is evidenced in their correct, compact wheel-type design, superior quality construction and fine engineering. A balanced combination of practical features that accounts for their better performance, that prompts enthusiastic praise from owners everywhere. Ask your nearest CLEVELAND owner for proof of performance and see your CLEVELAND distributor for specifications.



THE CLEVELAND TRENCHER CO.
20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

ume and strength of milk waste per 1,000 pounds of milk intake daily . . .

We feel this error should be corrected, as the data in your article will unquestionably be put to use by many practicing engineers in the field.

A. J. Fox
The Dorr Co.,
Chicago, Ill.

(Ed. Note: We regret this error and thank Mr. Fox for calling it to our attention. A further correction is made on another page of this issue.)

KILLING WEEDS

During 1949 we sprayed most of our 900 miles of road with 2-4-D weed killer. We had two tractor-mounted sprays, one mounted on the right side and one on the left side so we could spray both sides of the road on one through trip. A third spray outfit was mounted on a truck. This had long hose connections for spraying the fence corners at intersecting roads. We used a strong solution of 2-4-D at corners to try to kill brush to provide better sight distance, and used a solution of less strength on the straight away.

The indications are that we did a pretty good job of killing brush at the corners, but we cannot tell for sure until next growing season.

We had some complaints about injuring adjacent tomato plants due to drifting of fumes from the spray, but on investigation could find no conclusive evidence that the damage to the plants were from the spray. In one instance the plants were 300 ft. from the road, and tender weeds between the road and the tomatoes were not affected. An expert plant man said the tomatoes were suffering from a blight that was common last year.

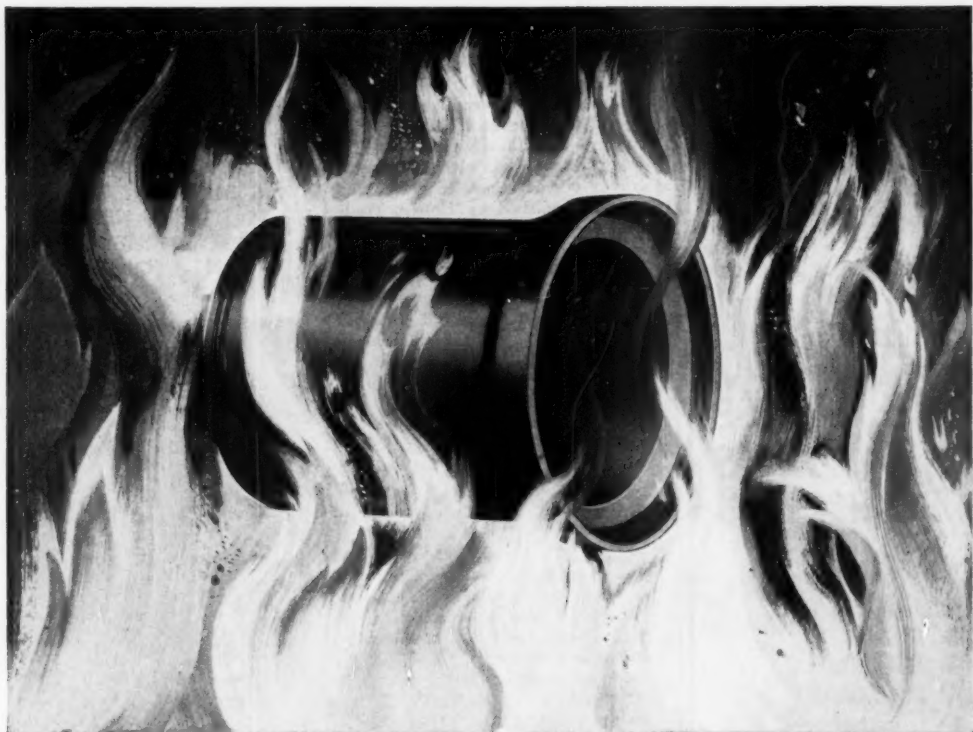
If your publication gets any information on this sort of claimed damage, I would be glad to see an article on it.

A. W. Young,
Allen County Engineer,
Iola, Kansas.

BOOKS IN BRIEF

ELECTRIC ARC WELDING

A comprehensive and practical textbook on the procedure and practice of arc welding which will help the engineer and designer as



CLAY PIPE...fused by fire for EVERLASTING service

VITRIFICATION — the heat-bonding process that makes Clay Pipe tough, corrosion-proof, and everlasting — takes place at temperatures exceeding 2000° F. Under carefully controlled firing, the minute particles of rock that have been formed into Clay through centuries of nature's purification are fused *permanently* together. Vitrified Clay Pipe needs no coating to protect it from the corrosive action of sewage, ground waters, soils, or industrial waste. It's chemically inert, completely safe from the acid attack that destroys so many materials. No other pipe offers all the *necessary* advantages of Vitrified Clay Pipe. That's why

it's universally preferred for sewerage and drainage installations.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

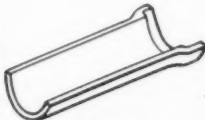
1105 Huntington Bank Bldg., Columbus 15, Ohio
703 Ninth and Hill Bldg., Los Angeles 15, Calif.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.

SPECIFY

Vitrified



**STANDARD-
STRENGTH
CLAY PIPE**



**CHANNEL
CLAY PIPE**



**CLAY PIPE
FITTINGS**

When writing, we will appreciate your mentioning PUBLIC WORKS

C 350 2



- Flies
- Weeds
- Mosquitoes
- Psychidae
- Grasshoppers
- Gnats
- Mice
- Rats

There is no longer a need to be bothered by these pests. With the constant advances made in insect, rodent and weed control they are no longer the nuisance they were in the past.

Public Works Officials, throughout the United States, find that with the use of CHEM-SECT BRAND chemicals, their pest control program costs have been reduced and their effectiveness increased. We have designed our chemicals specifically to be used with the equipment available for the control of weeds and insects. CHEM-SECT BRAND products have proven their effectiveness in many localities throughout the country.

Our staff of skilled technicians, fully abreast of the latest chemical and applicator developments, have formulated the most effective pest control products

We invite your inquiries for specific information on your problem.

FREE samples of our products are available upon request.

CHEMICAL INSECTICIDE CO.

285 VAN BRUNT STREET
BROOKLYN 31, N. Y.
TRIangle 5-0087

well as the welding operator. Clearly written chapters include discussion of various types of joints and welds and show allowable loads. Equipment is thoroughly described; special problems such as pipe welding are individually treated. This 544-page book has over 600 photographs of operations, diagrams and charts. Published by Hobart Trade School, Troy, Ohio. Priced at \$3.00.

DATA ON GASES

This bulletin presents a series of compressibility charts covering broad pressure-temperature ranges. Sections are: Real gases; horsepower equations for a real gas; and flow through nozzles. Write Worthington Pump & Machinery Corp., Harrison, N. J., and ask for Bulletin F-7637.

HIGHWAYS & ECONOMY

A 77-page booklet containing a report of the Joint Economic Committee on the current highway needs of the nation. It outlines existing deficiencies in the highway, road and street system which, it is estimated, will require 41 billion dollars for correction. For a copy of this worthwhile information, write your Congressman or Superintendent of Documents, Government Printing Office, Washington 25, D. C. No price is given.

FLOW METER ENGINEERING

The "Principles and Practice of Flow Meter Engineering" by L. K. Spink, is published by the Foxboro Co., Foxboro, Mass. This is the 7th edition; it contains a new section by R. L. Parshall, giving design details, operating instructions and tables for the Parshall flume. Much information, including how to calculate an orifice, flow nozzle, Venturi tube, Pitot tube or elbow for flow measurement. 416 pages of text and illustrations. The price is \$7.

REVIEW & FORECAST

A Mid-Century review of important engineering events in which Westinghouse has participated. Most of this naturally refers to electrical engineering. The presentation is a remarkable one, covering 100 well written and finely illustrated pages. We believe this can be obtained by writing the Westinghouse Engineer, PO Box 1017, Pittsburgh 30, Pa.

Water is Vital!

ITS PROPER TREATMENT
IS SO IMPORTANT AS
TO DESERVE NOTHING
LESS THAN THE BEST IN
PLANT EQUIPMENT



IRVING SUBWAY GRATING
IN WATER TREATMENT PLANT

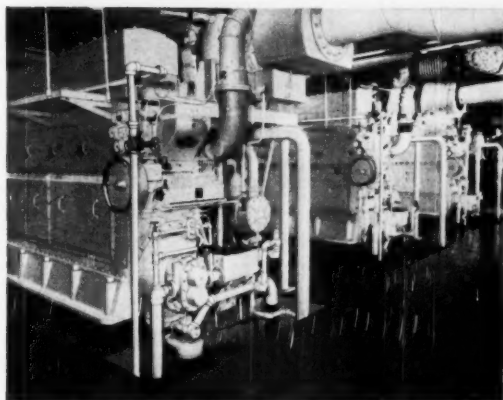
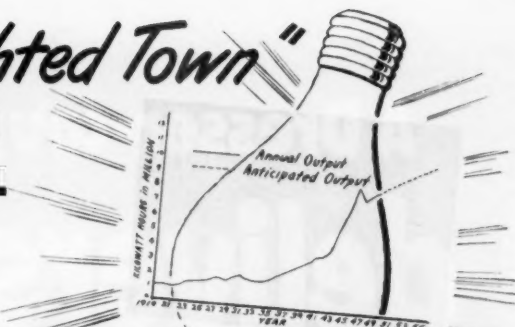
For the Best in
**WALKWAYS
AND
STAIRWAYS**
Specify
**IRVING
GRATINGS
and
TREADS**

and get maximum
**SAFETY
CLEANLINESS
DURABILITY
ECONOMY**
Catalog on Request

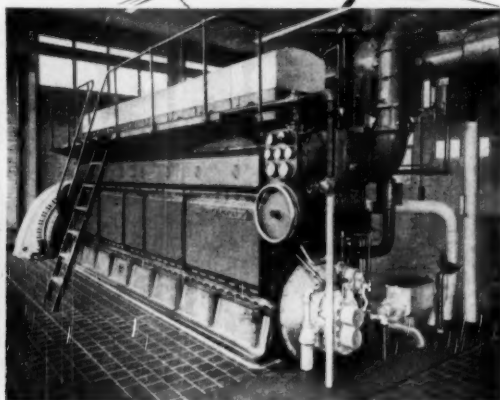
IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902
HOME OFFICE and PLANT: 5053 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVE
EMERYVILLE 8, CALIFORNIA

IOWA'S "Best Lighted Town"

SETS A PATTERN FOR SUCCESSFUL POWER PLANT EXPANSION



Three of Waverly, Iowa's earlier Worthington Diesels after conversion to supercharging.



Latest Worthington installation in the Waverly Municipal Power Plant. A new Type SEH-8 Supercharged Diesel.

Boasting one of the country's most modern municipal power plants, Waverly, Iowa, has long depended on Worthington Diesels to meet its ever-increasing demands for electric power.

Back in 1938 Waverly installed its first Worthington Diesels, a D-5 and two EE-5's, adding an EE-8 in 1941. During 1947-1948, the speed of the three EE's was stepped up from 327 to 360 rpm, and they were supercharged — increasing each engine's output 65%!

Still more capacity was provided in 1949, when a Worthington SEH-8 (Supercharged) was placed in operation, climaxing the Iowa city's eleven-year record of complete satis-

faction with its Worthington Diesel equipment. The economy achieved by conversion to supercharging is strikingly proved by latest figures, which show 11.1% gain in kw hrs per gallon of fuel over the pre-supercharged period. And Waverly reports particularly gratifying results from its converted EE-8 and latest SEH-8. During the year ending March 31, 1949, the former produced 14.48 and the latter 14.42 kw hrs per gallon, at engine

running capacity factors of 59.2% and 45.6% respectively.

Plan On Lower Cost Power

Far-sighted communities everywhere are profiting by the very real economies of Worthington Diesel performance in power, light and sewage disposal programs. Further facts proving *there's more worth in Worthington* will aid your own planning. Write to Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

WORTHINGTON



**YOUR
PARTNER
IN
POWER
PROGRESS**

WORTHINGTON-BUILT AUXILIARIES

Diesel engines, 150 to 3,520 hp ... gas engines, 175 to 3,520 hp ... dual fuel engines, 225 to 3,290 hp.



Balanced Angle Compressors



Oil Transfer Pumps



Cooling Water Circulating Pumps



Evaporative Type Engine Water Cooler

When writing, we will appreciate your mentioning PUBLIC WORKS

A Dresser-coupled steel line delivers water cheaper...

The cheapest way to deliver water to the place where it turns into revenue is with a Dresser-coupled steel line—the line that

- Cuts installation costs
- Cuts leakage losses
- Cuts maintenance costs

Strong, shatterproof, yet lighter in weight, steel pipe swings into place easily. Each section goes as far as several sections of more cumbersome alternate pipe. You have fewer joints, and those more easily and quickly made with Dresser Couplings. Your line is in service sooner . . . you save costly man-hours.

The flexibility of Dresser Couplings cushions every joint and harmlessly absorbs vibration and other stresses that cause rigid lines to leak. You get a permanently tight line that delivers all the water you put into it.

You save on maintenance because the flexible-tight Dresser line "lives in the ground" comfortably and because modern glass-smooth linings assure high-sustained carrying capacity, life-long service.

See your Dresser Sales Engineer, or write today for literature.



In Springfield, Mass., as many as 40 long lengths of pipe were laid and joined in an eight-hour day, using a two-man joining crew.

BE SURE you get the best line at the best price. Put steel pipe and Dresser Couplings in your specifications.

DRESSER "FLEXIBLE-TIGHT" COUPLINGS

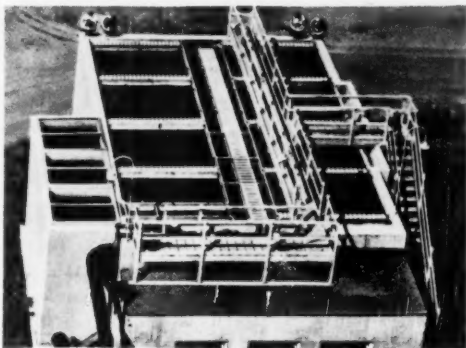
Dresser Manufacturing Division, 59 Fisher Avenue, Bradford, Pa. (One of the Dresser Industries). In Texas: 1121 Rothwell Street, Houston. In Canada: 629 Adelaide St., West, Toronto, Ontario. Sales Offices: New York, Chicago, Houston, Philadelphia, San Francisco.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.



SLUDGE BLANKET

**fresh and active
at all times!**



● Operating on the principles of precipitation, adsorption, settling and upward filtration, the Permutit Precipitator lends itself to a variety of applications besides softening: removal of turbidity, color, taste, odor, alkalinity, silica, and fluorides.

Write for full information to The Permutit Company, Dept. PW-3, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., Montreal.

Permutit®

*Water Conditioning
Headquarters
for over 36 years*

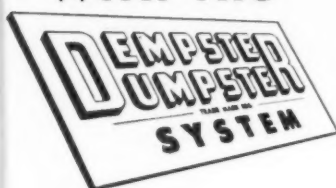
IMPORTANT OPERATING ADVANTAGES:

1. Saves you up to 50% in space
2. Saves you up to 40% in chemicals
3. Saves you up to 75% in time
4. Short detention time
5. Uniform sludge filter
6. No settling of precipitates
7. High adaptability to variable flow rates

Streets and Alleys Stay Clean Automatically—



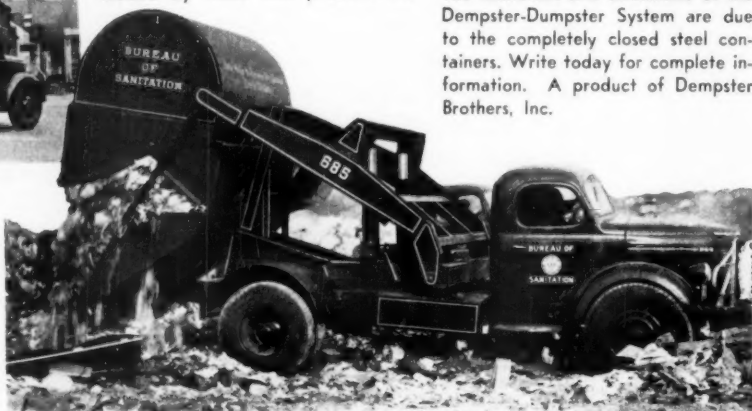
—With the



The amazingly simple stages of picking up, hauling and dumping a 10 cu. yd. Apartment Type container are shown in the three photos.

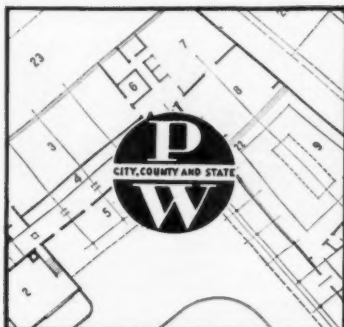
Cities, large and small, are doing what you can do to keep your streets and alleys free of rubbish, litter, rats, flies and scavengers . . . and at tremendous savings! Baltimore, Boston, Richmond, Birmingham, Pensacola and scores of other large and small municipalities have adopted this modern Dempster-Dumpster System by which one man and one truck hoisting unit serve a large number of detachable containers. These containers hold 8 to 10 cu. yds. of trash and rubbish, and, bear in mind, are always loaded by those who produce the

trash, ready for driver to haul away. If you use the old-fashioned, costly and unsanitary open truck method of collection, it will pay you to investigate the Dempster-Dumpster System. Containers are placed at convenient accumulation points at housing projects, schools, apartment and market areas, factories and down-town stores. When a container is filled, it is picked up by the truck hoisting unit and hauled to disposal area where container is automatically dumped by hydraulic controls at driver's seat. The sanitation and cleanliness of the Dempster-Dumpster System are due to the completely closed steel containers. Write today for complete information. A product of Dempster Brothers, Inc.



DEMPSTER BROTHERS, 930 Dempster Bldg., Knoxville 17, Tenn.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89



PUBLIC

MARCH 1950

VOLUME 81

NO. 3

WORKS

MAGAZINE

How A Planned Public Works Program Benefits A City

ROBERT R. MCINTOSH

Director of Public Works
Battle Creek, Mich.

THE financial outlook for municipal affairs in the City of Battle Creek, Michigan, was at a low ebb in 1947. Operating under a fifteen mill-limitation, which was divided between the County, the Public Schools and the City, the revenues, in view of the deflated dollar, were hardly sufficient to keep the operating forces supplied with the minimum of help and equipment.

Previous years of war and depression had contributed to the obsolescence of equipment and the deterioration of streets and other municipal facilities. Very few storm and sanitary sewers had been laid for fifteen years and practically no paving had been constructed. The Water Division of the Department of Public Works was badly in need of greater capacity which could be provided only by long range improvements. Nearly all of our paved streets needed immediate attention. A survey showed that the City needed forty-five miles of sewers to serve the 12,500 people who had no public sanitary sewer connections. The traffic situation and the parking conditions were reaching a point where action had to be started at once to alleviate them. The city is situated at the junction of two rivers, the Kalamazoo and the



● **THIS parking lot at Van Buren St. was completed in October, 1948.**

Battle Creek, and the flood situation was getting out of hand. Petitions for curb and gutter, sidewalks, surfaced streets etc., were on hand dating back as far as 1938. It was apparent that some realistic and organized plan for procedure was necessary.

With practically a new commission elected in April, 1947, three members out of five having been

elected at that time, discussions were held to determine what procedure should be followed. It was decided that one of the first steps should be to have a qualified firm of Management Council make a study of the Municipal Management of the City and consequently a firm (Griffenhagen and Associates of Chicago) was employed to do this. This study was not completed

until the middle of 1948, but recommendations were put into effect as quickly as they became available, the latest innovation being the establishment of a Central Equipment Maintenance Division. Previously perpetual inventories had been set up, classification of employees had been made and a Stores Division was established. Other changes involved methods of billing taxes, water and sewer rates and other assessments. Modern



office equipment was installed for more economical operation.

In 1948 the legislature of the State of Michigan passed legislation removing 11 cities of the state from the fifteen mill-limitation. Since it became effective one year after the passage of the legislation, unless voted upon by the community, it was necessary to call a special election in Battle Creek in July, 1948. At this time the tax payers voted



to remove themselves from the fifteen-mill limitation and permit the city, separate from the county and the schools, to levy additional taxes up to ten mills for city purposes. Passage of this measure was preceded by a study made by a "Citizens Committee on City Improvements", which reviewed the overall essential expenditures that needed to be made to finance a program for rehabilitation of the various facilities of the city which had been allowed to deteriorate. It was found that the primary requirement was the rehabilitation of city streets. As a result, one of the slogans of the campaign, which was carried on by this committee to acquaint the public prior to election with the



● **PAVER and roller laying 1½-inch bituminous surface.**

problems that were being faced, was "SOS" or "Save our Streets." Since this was a project for number one priority it was only natural that it should be the first one to receive attention as soon as the funds were assured.



A survey conducted by the Department of Public Works indicated that there was an immediate need for resurfacing, in the first year, or 1948, 21.8 miles out of a total of 77.3 miles of paved streets in the city. This work was accordingly scheduled, specifications were drawn and a contract let (to the Globe Construction Company of Kalamazoo, Michigan), for 9.2 miles of 2-inch bituminous concrete resurfacing. The balance of 12.6 miles consisted of 1.3 miles of double seal coat and 11.3 miles of single seal coat which were applied by force account, some of the new tax money being used for the purchase of suitable equipment for this work. In addition to the 21.8 miles of street resurfacing with bituminous concrete or seal coat, an additional 7.4 miles of streets in which sewer or other improvements were installed were gravel surfaced.

The above program covered what might be called emergency situations which had to receive attention quickly in order to avoid deterioration.

In the following year, 1949, the

city let, by contract, 2.50 miles of bituminous concrete resurfacing, 1.84 miles of bituminous aggregate and 0.56 mile of sheet asphalt. By force account the city at the same time applied 12.24 miles of single seal coat and 2.34 miles of double



seal coat. Thus in two years, the city resurfaced, in one form or another, 41.28 miles of pavement. The choice as to type of surfacing depended entirely upon the use of the various streets by traffic.

Curb, Gutters and Sewers

The Department of Public Works was also busy in other fields during these years and in 1948 installed, by contract (with the Titus Construction Company of Kalamazoo, Michigan), 21,611 lineal feet of curb and gutter and 23,696 square feet of driveway approaches. This curb and gutter program in 1948 benefited 298 homes and 78 vacant lots. In 1949, an additional 31,541 lineal feet of curb and gutter and 63,207 square feet of driveway approaches were constructed, benefiting 416 homes and 149 vacant lots. The total for the two years was 53,152 lineal feet of curb and gutter and 86,903 square feet of driveway approaches, benefiting 714 homes and 227 vacant lots.

In 1948, the Street Division re-laid, by force account, 12,000 feet of sidewalks in view of sewer construction and in 1949 a contract was

awarded (to the Monte Construction Company of Detroit, Michigan) for 18,360 lineal feet of 4½-foot wide new sidewalk, or 82,623 square feet. This has been completed.

New Equipment Saves Money

While these projects were underway the Street, Water and Sewer Divisions were being re-equipped with seventy-five pieces of new equipment to replace obsolescent equipment which dated from 1942 to as far back as 1925. Approximately \$22,000 of this cost was met by the disposal of scrap gathered on city property throughout the city and sold at the high price prevalent during 1947 and 1948. In the Street Division the equipment added included: an Athey Loader; a 1¼-yard Bay City crane with dragline and shovel; a Link Belt ½-yard Speeder with dragline, on rubber; a Byers ¾-yard crane with dragline

of new drives and parkways and cleaned up seven objectionable dumps out of fifteen in the City and closed them.

Considerable attention was also paid to alleviating traffic conditions, and by force account and contract, four streets were widened. One of them was widened 12 feet, the widening being for a distance of 3,124.58 lineal feet; other streets were widened from 3.2 to 9 feet for a total of 2,228.45 lineal feet. The completion of the parking lots and widening projects in our downtown district has relieved the urgent traffic situation which confronted us early in 1947. During 1948 and 1949 the Street Division equipment traveled 788,492 miles; made 17,315 square feet of street repairs on improved streets; and placed 20,706 cubic yards of gravel on unimproved streets. At the same time 1,166 new street signs were installed.

Just to wind the two years activities up properly the Division constructed 2.6 miles of new gravel access roads, which will be part of a continuing plan for traffic relief.

Late in 1949 the City employed the firm of Harland Bartholomew and Associates to work out a master plan for the City of Battle Creek covering:

1. Scope and Economic Background
2. Population
3. Land Use and Zoning
4. Major Streets and Parking
5. Annexation of Urban Areas
6. Transportation
7. Transit
8. Housing and Drainage
9. Schools and Parks
10. Public Buildings and City's Appearance
11. Public Works Program

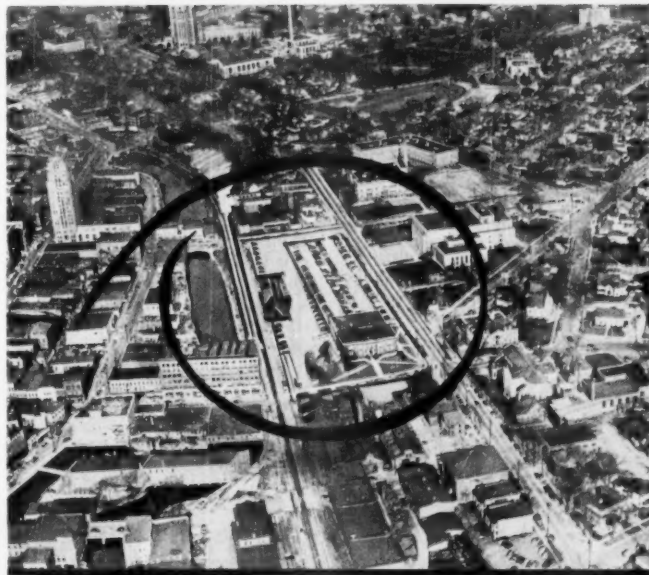
This study is now well under way.

(Continued on page 50)



and trench hoe; 22 new dump and flat bed trucks; two Case endloaders, for leaf collection; one Good Roads leaf collector; two Austin graders; a gasoline driven 5-10 ton Galion roller; a D-8 Caterpillar tractor with LeTourneau scraper-loader; a D-6 Caterpillar tractor with scraper loader; an Elgin street sweeper; a Sullivan 105 air compressor; three new sidewalk plows; one South Bend distributor; one Bucyrus Erie 3-ton Hydrocrane; one spreader; three sanders; one steam jenny; and other miscellaneous tools and equipment.

Making use of this equipment, the Street Division constructed three new parking lots, the capacity of which are 172, 212, and 111 cars respectively, for a total of 495 cars on three lots, all in the downtown area and strategically located adjacent to the business district. All of these lots were covered with 1½-inch bituminous surfacing, totaling 2,563 square yards and enclosed with fence enclosures or suitable concrete walls. At the same time this Division moved slightly over 80,000 yards of dirt in the creation



● AERIAL view of business section, Van Buren parking lot in center.

DEEP OUTFALLS FOR SEWAGE

A. R. MacPHERSON

IN PAST years, the cities located on Puget Sound were not faced with the same problems of sewage disposal as were the inland cities. These Sound cities simply ran their trunk sewers out into the adjacent waters where tidal currents conveniently and economically dispersed the sewage. However, with the increasing popularity of salt-water fishing in this area in recent years, there has been growing an insistent demand on the part of thousands of sports fishermen for better protection of fishing against sewage pollution.

It is not an uncommon sight now for visitors to Tacoma to see several hundred boats out on Commencement Bay, with sportsmen intent on catching the big and popular Puget Sound salmon. The fact that all of the sewage from 140,000 people also pours into this same bay gives many fishermen unpleasant thoughts.

To Prevent Pollution

To remedy this insanitary situation, the Commissioner of Public Works of Tacoma, J. S. Roberts, and C. S. Seabrook, Engineer in Charge of Sewers, have planned a sewage disposal plant embodying some new ideas. They state this new plant will save the city \$250,000, while providing adequate protection to the Puyallup River and the other waterways adjacent to the city.

Their plan is part of the \$3,000,000 trunk sewer and treatment plant program voted by the citizens of Tacoma in 1944. A large part of the

program of sewer construction has already been carried out. Construction of the sewage treatment plant, however, had first to be approved by the State Pollution Commission. This approval was recently received.

The usual process of sewage treatment involves the separation of the solids from the liquids by sedimentation, with further treatment for the effluent, if required, and digestion of the solids, followed by drying and perhaps use as a fertilizer. Sludge disposal, while occasionally bringing in some revenue, generally results in expense.

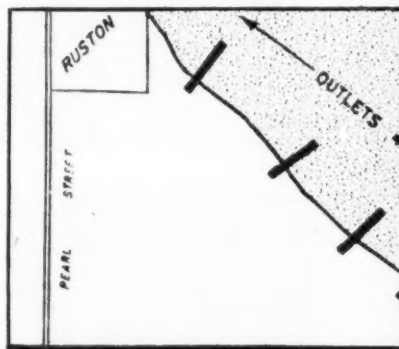
Tacoma's Plan for Sewage Disposal

Under the plan adopted by the city, it is proposed to provide preliminary or primary treatment for the sewage from a portion of the city, and to chlorinate the sludge and deposit it 2,500 ft. offshore on the bottom of the bay, at a depth of approximately 200 ft. At the location chosen, tidal currents are swift and the oxygen content of the water is adequate. It is believed that there will be no serious depletion of the oxygen content of the water as a result of the discharge of the sludge. Silting is not expected to be a problem, since the bay is over 500 ft. deep at the center and there are no shoals or shallows. The liquid effluent will also be chlorinated, and the probability of serious bacterial pollution is believed to be negligible. Visible nuisance from floating materials, oil and grease, is expected to be eliminated by the treatment plant.

It is also proposed to lengthen the outfalls of certain existing sewers

now discharging into the bay, so that the sewage passing through them will be deposited where it will be picked up by tidal currents and carried out to sea. The cost of doing this work, it is stated, should be covered by the savings realized on the treatment plant.

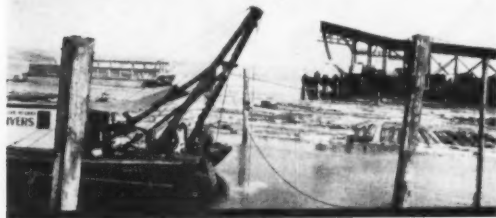
Only sewage from the south por-



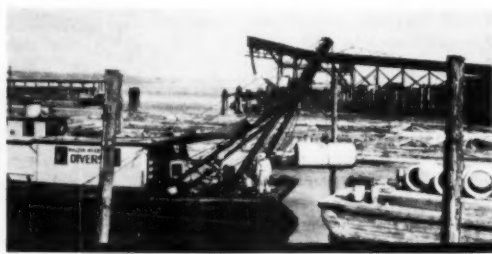
tion of the city will pass through the new disposal plant. Sewage from other portions of the city will be discharged directly into bay water from a number of existing outfalls which have recently been reconstructed.

The sewer improvement project involved the installation of eight underwater sewer extensions or submarine outfalls, with a total cost of \$410,000. This job, now nearly completed, involved the laying of submarine rail tracks, believed to be the first such installation ever constructed for such a purpose.

The project involved some unusual engineering problems. These



● DIVER on way to straddle pipe for ride down.



● CRANE lowers a length to underwater track.

AND SLUDGE DISPOSAL

were solved in a novel manner by R. J. Anderson of the city Public Works Department. The job was carried out jointly by Industrial Engineers & Contractors and Walter McCray Divers Co., both Tacoma firms. The purpose of the submarine outfalls was to carry the sewage from the existing shore discharge

outlets into the deep waters of the bay, somewhat more than 600 ft. from shore. In these deep waters, it is expected that tidal currents will be sufficient to assure thorough dispersion, reducing to a minimum the contamination of bathing beaches and fishing waters.

The first phase of the work in-

involved digging a trench in the bottom of the bay for each outfall, running out into the bay some 600 ft. A floating derrick, using an orange-peel bucket was employed for this work. An experienced diver handled the underwater operations, with two men on the barge operating the air compressors and hoisting machinery.

After the trench had been dug, a double row of creosoted piles was driven down into the trench with a pile driver. These were then cut off at the trench level by the diver, and heavy timbers were fastened with drift bolts across the tops of the piling. A rail track was then laid on cross ties supported on these beams, the rails being spiked down. The purpose of this underwater trackage was to provide a uniform and permanently secure support on which the heavy concrete pipes forming the outfall could be laid.

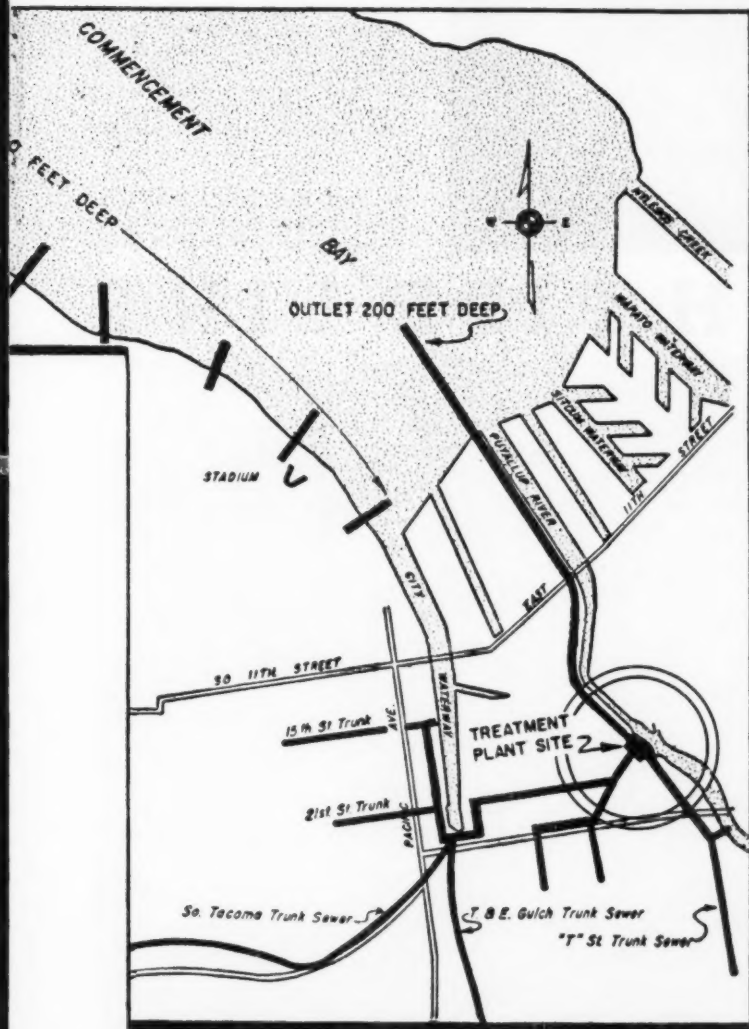
The pipe used was Lock-Joint, with rubber gaskets, adjacent sections being bolted together. Each section is 36 ins. in diameter, 6 ft. long, and 3 ins. thick; weight is 4,400 pounds. The pipe, which is reinforced, was furnished by Graystone Products Co.

Before submerging, a rubber gasket was placed around one end of each length of pipe. The length was then lowered to just below the surface and the diver straddled the pipe and rode it down to the bottom of the bay where he maneuvered it into position on the track. When the pipe was placed properly, the diver tightened the lug bolts to form a watertight joint. Working on a 6-hour shift, with occasional periods for rest, he was able to place about ten sections of the pipe a day.

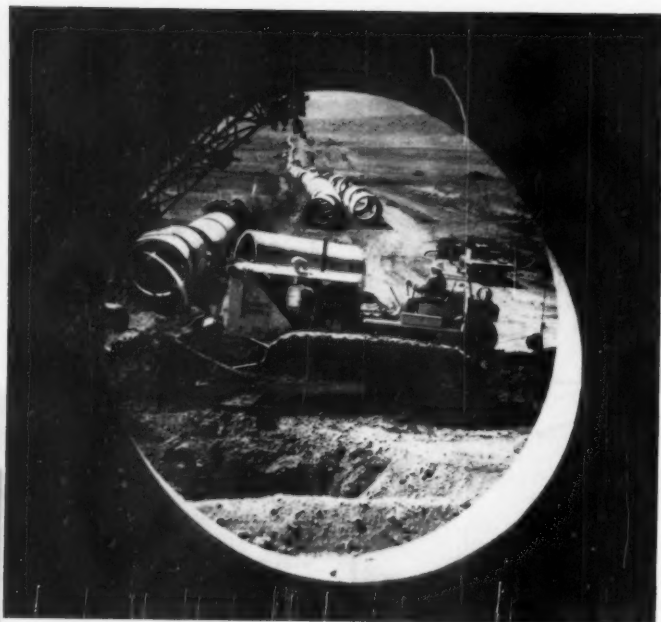
After each section of submarine outfall was laid, it was covered with a dirt fill. It is expected that, even though the piling and beams will eventually decay, silt and other material will have settled around the pipe by that time to provide a permanent and solid support.

The deepwater terminals of the outfalls lie at an average of 40 ft. below mean low tide, thus insuring protection against damage by shipping.

The project was supervised by Tom Hauser for Industrial Engineers, while E. H. White, city engineer, representing the city of Tacoma. The diver, Legrande Blackburn, who has had many years of experience in this field, did all of the underwater work for the McCray Divers Company.



● MAP shows treatment plant location and sewer outlets.



tions, weighed about 23 tons per section. In the manufacture, double reinforcing cages were fabricated of $\frac{1}{2}$ -inch to 25/32-inch hot rolled reinforcing rods, which were wound spirally on collapsible mandrels. To each end of the inner cage, special steel joint rings were welded. The cages were then set vertically over inside forms of steel, 90 ins. in diameter, and steel outside forms were clamped around the cages. The spacing between the inner and outer forms was 8 ins., so that when the concrete was poured between the forms, the reinforcing was embedded in an 8-inch concrete wall.

Special base rings, on which the forms, the reinforcing was embedded platforms, which covered the forms, helped to hold the reinforcing firmly in the proper position. As the concrete was poured, the forms were vibrated electrically to assure a dense concrete. After a suitable

Courtesy Caterpillar

● *View through a section of a pipe shows a tractor-bulldoxer at work and long lines of pipe.*

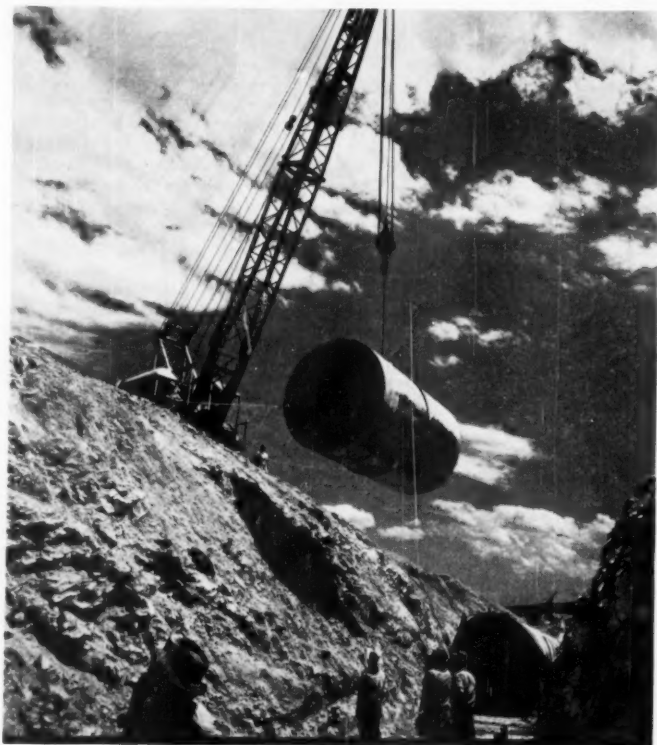
90-INCH PIPE LINE

SOME time this spring, Denver, Colo., will put into service its new 90-inch pressure pipe line from the Platte River source to Marston Lake, Denver's principal impounding reservoir. The new line is 10½ miles long, including a one-half mile tunnel. The pressure line is constructed of Lock Joint reinforced concrete pressure pipe, replacing a wood stave conduit. The project required the manufacture and installation of 52,252 feet of 90-inch reinforced concrete pipe. The line ties into the tunnel, which will be gunite-lined, 96 ins. inside diameter. The tunnel is being constructed by the city.

Details of the Pipe

About 250,000 sacks of cement, 5,000 cu. yds. of aggregate and 5,000 tons of reinforcing steel went into the production of the Lock Joint pipe. The pipe was manufactured at the rate of 265 ft. per day at a temporary plant in Englewood, on the outskirts of Denver.

The pipe, made in 16-ft. long sec-



Courtesy Lock Joint

● *CRANE handles 23-ton section of pipe into trench for assembly into completed pipe line.*

curing period, the pipe was loaded out of the yard on lowbed trailers and delivered to the ditch side.

Trenching and Laying Pipe

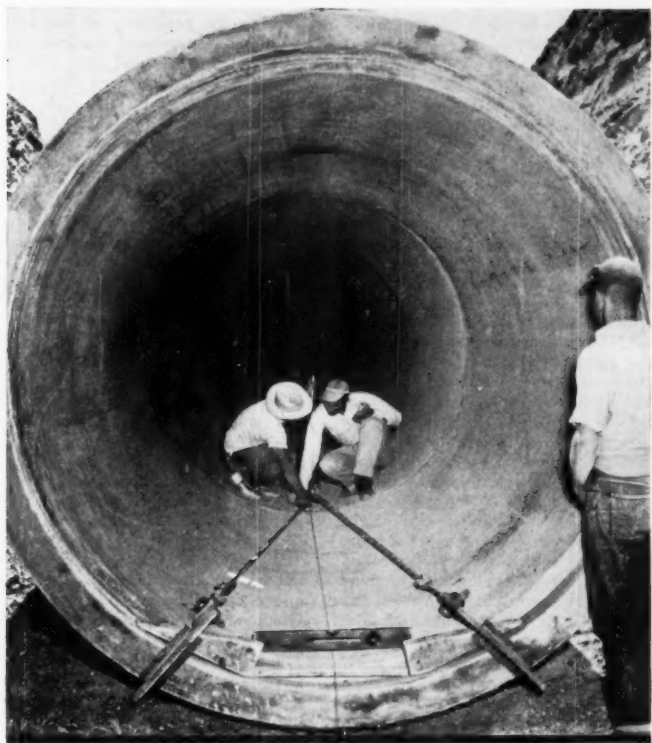
The ditch was excavated with a 2½-yd. Northwest 80D dragline and the pipe was lowered into the trench with a 1204 Lima crane. Assembly of the individual sections of the pipe was by means of the Lock Joint rubber and steel joint. This consists of a steel spigot ring having an annular recess all around the circumference, and a flared steel bell ring. A round rubber gasket, thoroughly lubricated with vegetable soap, was stretched around the spigot and settled into the annular groove. The crane entered the spigot end of the pipe into the bell of the pipe already installed. A dead-man, placed in one of the pipe already installed, acted as an anchor for a hoist whose lead line

Courtesy Lock Joint

● **TRUCK** hauls lengths of 90-in. pipe on low-bed trailer from plant site near Denver to job.



brings WATER to DENVER



was attached to the bell end of the pipe being laid. By taking up on the hoist, the spigot end of the pipe was drawn firmly into the bell of the pipe already in place. As this was done, the rubber gasket was compressed to form a water tight seal between the two pipes. Further to protect the zinc-coated steel joint rings, grout was poured into the recesses between the pipe sections.

This project is a part of the \$23,000,000 water development program now under construction by Denver. This will include extension of the new 90-inch line all of the way to the dam on the Platte River. D. D. Gross, chief engineer of the Board of Water Commissioners of Denver, is in charge of the work. H. R. Oliver is engineer on the tunnel job and construction is in charge of M. L. Sowell. Frank Squires was the Lock Joint manager on the project. Gordon-Bressi and Bevanda are subcontractors on the pipe installations project, with Roscoe Downs in direct charge of the work.

Courtesy Lock Joint

● **DEAD-MAN** in pipe already installed acts as anchor to draw pipe sections together for joint.

JEEP and SNOW PLOW

CLEAN

OUTDOOR ICE RINK

N. W. NESTER

OUTDOOR ice skating has, for some years, been maintained during the winter months by the city of East Cleveland, Ohio, at a lake in a municipally owned park. The lake which has a surface area of 5.88 acres is fed by surface drainage and is maintained at a depth of from 3 to 3.5 feet through use of a weir at the outfall.

Prior to 1947, snow removal was accomplished by a wheeled tractor, when the depth of the ice would support the load of the tractor. When the ice was not heavy enough for the concentrated load of the tractor, the snow was removed by hand. The hand process was slow and expensive and only about 20% of the surface was kept free of snow. Where the snow was pushed by hand to windrows, the ice underneath these became soft and mushy and this condition soon spread to the clean ice. This reduced the skating area and required barricades to warn skaters of the danger spots.

During the 1946 winter season, a large V-plow was constructed and assembled on the ice. The plow was moved by a winch and cable through a series of pulleys. The use of the plow, a cumbersome device, was unsatisfactory because of the weight of the plow, the length of the cable and the difficulty in dragging the plow back to the center of the lake.

Solving Snow Removal

In the spring of 1947, the city purchased a jeep equipped with a snow plow. It had been planned to experiment with the plow in snow removal from sidewalks. Inasmuch as a considerable portion of the sidewalks in the city were 4 feet in width and the minimum width of



the blade when swung on a maximum angle was 5 feet, the operation was not too successful.

The jeep was then tried during the 1947-48 winter season on snow removal at the lake. To prevent a possible drowning of the jeep through ice failure, two 2-inch pipes approximately 14 feet in length were bolted to the front and rear bumpers. At the extremities of the pipes, 2x12 inch planks were bolted, forming an outrigger arrangement. It was believed that if, due to the concentrated load, the jeep broke through the ice, the outriggers would support it and it could be skidded to shore without damage to the motor. It was later learned that the outriggers were unnecessary since the total load of the equipment was not sufficient to cause ice failure after a thickness of 4 inches was developed. However, the pipes served another purpose. The planks were removed, and the pipe had a tendency to level drifts to a height where the blade would handle them.

It was found that the best method for cleaning the lake was to start at the approximate center of the lake with the blade tilted out. The jeep was driven in an ever increasing circle or spiral. When the snow depth became too great for the plow to handle, this method was discontinued, the blade was straightened, and the machine moved toward the



● AT WORK, above, the jeep-snow plow rig is shown below.

shore on radial lines to remove the snow to the periphery of the lake.

The snow removal method was very satisfactory and the 1947-48 season provided the best skating in the history of the lake. The cost of cleaning decreased while the area cleaned was increased greatly. The entire lake could be cleaned of a two-inch snowfall in about two hours.

One other use was found for the jeep with plow. Normal procedure for street snow removal was the use of two or three trucks, dependent on the width of the street, with plow attachments plowing in tandem. Each plow bladed the snow toward the curb with the last plow windrowing the material at the curb. Where intersections were crossed, the side streets were practically blocked until they were cleared by hand. The jeep was utilized to clear the intersections by pushing the snow to the corners. The use of the jeep provided additional savings in snow cleaning in the municipality.

Wherever ice skating facilities are maintained by municipalities, the above described method for maintenance is highly recommended. The operation is efficient and economical. The lake maintenance in East Cleveland was accomplished with water distribution system personnel under the supervision of J. E. Barnes, Superintendent of Water.



● **FINISH**-grading the stability berm on the 11.5-mile contract of Porter DeWitt Constr. Co., near Forbes Bend, Mo.

Illustrations courtesy Caterpillar

AN 18-ft high levee is being constructed along the Missouri River from Rulo, Nebr., to Atchison, Kansas, serving the residents of six counties—two in Kansas, three in Missouri and one in Nebraska. The 62 miles of levee, which is being constructed under seven contracts, will protect a farming area that, in the past, has been subjected to heavy flood damage.

The Missouri is remarkable in a number of respects—its sudden rises, the swiftness of its current, and its ability to erode its banks. There are two principal flood periods. One is in April and the other in June, both due to melting snow and ice. The former is caused by lowland melting; the latter by the snow in the mountains. The June rise lasts from three to five weeks; the April flood is shorter in duration.

The levee, which varies somewhat in height, but averages 18 ft., has slopes of 3 on 1, with a 10-ft. wide crest and a wide stability berm on the landward side. An estimated 12,600,000 cu. yds. of dirt will be required for completion. Among the contractors at work, and the progress made up to the end of the year, are: Jos. L. Pohl, who had completed 433,000 cu. yds. of a total of 2,759,000 yds., with John Morris as superintendent; Porter-DeWitt Construction Co., Mel Dark, Sup't., with a contract for 1,780,000 cu. yds., which is practically completed; O'Dell Riney Constr. Co., Henry Casey, Sup't., 1,146,000 cu. yds. of a total of 1,798,000; Condon-Cunningham, with Ray Terry in charge, with 756,000 of an estimated total of 1,903,000 cu. yds.; George Bennett Constr. Co., William Smart, Sup't., has practically completed a 1,428,000-yd. contract. Orshek, Inc., and Perry McGlone Constr. Co. are other contractors on this section.

HEAVY EQUIPMENT IS WORKING ON THE LEVEE



● **ABOUT finished**—spreading load of borrow on levee top.



● **PUSHER** helps move 14-yd. load out of borrow pit.

CONCRETE RESURFACING



● **REINFORCED** resurfacing, N. Main St., Charles City, Ia.



● **SEATTLE** used concrete for

J. F. COOKE
Portland Cement Association

THERE are several reasons why an original pavement may need resurfacing. When a pavement has reached the end of its expected life, it may naturally have developed unsatisfactory surface conditions, yet it may retain much of its original structural value. Other pavements may be structurally inadequate because of today's increasing traffic weights and volumes. After resurfacing with concrete, older roads and streets can accommodate present and future traffic. A considerable mileage of these pavements need widening to provide complete modernization. This, too, can be accomplished economically by resurfacing and widening with concrete.

The majority of rural concrete-resurfacing projects include widening. This accomplishes the dual objectives of strengthening the original slab and of providing a wider, safer pavement for today's traffic and tomorrow's.

Rural Road Resurfacing Projects

One of the largest and most interesting resurfacing and widening projects since the war was the modernizing of U. S. 30 near Cedar Rapids, Iowa. This old pavement had served well, carrying the ex-



● **NEBRASKA** resurfaces US 6.

tremely heavy weights and volumes of traffic on the famous Lincoln highway. But the passing years and millions of vehicles had their effect on the pavement. And the confining lanes of the 18-ft. wide pavement were too narrow to accommodate safely the heavy cross-country trucks regularly scheduled over this section. The Iowa Highway Commission decided to resurface and widen with concrete a 21.9-mile stretch of this pavement in the summer of 1949. The entire project is scheduled for completion early this spring, and about 10 miles have been opened to traffic already. The resulting safety benefits of wider traffic lanes are gratifying to motorists and truckers alike. Structural strength was increased proportionately, so that this section will accommodate increasing traffic for many years to come.

A similar project in Nebraska, a 9.34 mile section of U.S. 6 between Omaha and Lincoln, turned another inadequate highway into a modern one. This section of road carries the heaviest traffic of any two-lane rural road in the state—averaging 3,300 vehicles daily; 23 per cent of this traffic consists of trucks. Because of a poor subgrade condition and heavy damage to the road during years of heavy traffic, a 6-in. minimum thickness was decided upon. The pavement also was widened 2-ft. on each side.

... New Pavements for Old



resurfacing this old brick street.



● THIS resurfacing in Oswego, N. Y., dates back to 1919.

The experience of Seattle, Washington in resurfacing more than 323,000 sq.yds. of streets should interest many city officials contemplating similar rehabilitation. Back in 1923, the old brick surface of Union street was resurfaced with concrete, and has served increasingly heavy traffic volumes ever since. This is one example of how a pavement's life can be extended by taking advantage of concrete-resurfacing.

Seattle citizens have long been sold on concrete. In fact, this city's total of more than 11,000,000 sq.yds. of concrete streets is the largest per capita of any city in America over 100,000 population. And when rehabilitation is indicated, they resurface with concrete. Almost all of these resurfacing projects have been on downtown streets carrying the heavy traffic typical of metropolitan areas. Sections of Third and Fourth Avenues were resurfaced in

1928 and 1937 respectively. Another section of Third Avenue was resurfaced in 1943.

Other Concrete Resurfacing Records

Indianapolis' main street, South Meridian, was resurfaced in 1933 and is in excellent condition today. Other "Main Streets" resurfaced with concrete are in Cape Girardeau, Mo.; Coldwater, Michigan; Superior, Nebr.; Aberdeen, Washington; and Albert Lea, Minn., to name a few. East Bridge Street, Oswego, New York was resurfaced with 4-in. of concrete back in 1919. The original concrete base was placed in 1895 and 1898.

No matter what type of traffic a road or street may carry, it can be effectively salvaged—turned into a new pavement—by resurfacing with concrete. It has been done in all climates, in all sizes of cities, all over the country.

Designing Resurfacing

The problems of concrete-resurfacing are few, and the actual construction relatively simple and uninvolved. The old surface should first be put in good condition. Patching need not be extensive—only badly broken areas where the subgrade needs attention. The original pavement should be swept thoroughly before the concrete-resurfacing is placed. Old bituminous patches need not be removed.



● PLACING 2-ft. widening strip on US Highway 30 in Iowa.

Thickness of resurfacing can be determined by the formula:

$$R = \sqrt{T - Ct^2} \quad (1)$$

where: R = the thickness of resurfacing in inches;

T = required thickness of a single slab to carry the load;

t = thickness of the old pavement; and

C = a factor depending on the condition of the old slab.

C is 1.0 when the old concrete is in good condition; and 0.75 when there are a few joint and corner cracks but no indication of progressive breakage. From this point C may be reduced to as low as 0.35 when the existing pavement is badly cracked or broken. Generally, this formula computes thicknesses on the theory that the strength of the two slabs is equal to that of a single slab having a thickness equal to the square root of the sum of the squares of the two thicknesses.

This theory ignores any possible bond or friction between the old and new pavement and is proposed for resurfacing projects where there would be a separating course between the two slabs. It should also be used on concrete-resurfacing projects where there is no integral widening or curbs and thus where loads may travel on the pavement edge.

Where no such separating course exists or is used, some bond or friction will be developed between the old and new concrete and the formula described above will call for greater thicknesses than are structurally required. In these cases, where widening is constructed integrally with the resurfacing, or where curbs are used, the following formula has been proposed:

$$R = \sqrt{T^{1.50} - Ct^2} \quad (2)$$

The characters having the same meaning and value as in (1).

In the past, a minimum thickness of four inches has proved highly satisfactory and has increased the useful life of an originally under-designed pavement by many years. In general, thickness is determined by the condition of the old pavement and the volume and weight of traffic to be carried by the resurfaced road or street.

Unreinforced portland cement concrete is satisfactory in resurfacing projects where the old pavement does not show abnormal structural breakage or cracking. Where abnormal breaking or cracking has occurred, the use of reinforcement is desirable.

In jointing a concrete-resurfacing project, no prescribed standard can be followed. The design should include both longitudinal and transverse joints. They do not have to be of the same type or spacing as in the old pavement. Even though expansion joints were used at short spacings in the old pavement, they can be placed at long intervals in the resurfacing, or omitted entirely, except at intersections or structures. Contraction joints can be placed within one foot of, or over, existing expansion, contraction or construction joints. If this does not result in slab lengths short enough to control cracking, additional intermediate contraction joints should be placed to form equal slab lengths.

City Street Design

In resurfacing city streets, consideration must be given to existing curb exposures. Cross-sections should be taken showing the relative heights of curbs and corresponding sidewalk conditions. With this information, it can be determined whether it will be necessary to remove a portion of the existing pavement adjacent to the curb or to construct a new curb with proper height. If conditions permit, it is usually desirable to widen streets in anticipation of future traffic. This, of course, eliminates the need for pavement removal and solves curb exposure problems. For city streets, expansion joints should be placed at the property lines on each side of the intersections. The placing of contraction joints will be the same as for rural road projects.

Construction Methods

In general, the methods used in placing concrete on resurfacing projects is similar to those used in new construction. However, a few differences in technique are connected with resurfacing projects.

The concrete mixture used for resurfacing should be designed for

the special conditions which exist. As there is little or no absorption of water by the subgrade, the water content must be kept to the minimum consistent with satisfactory placement and finishing. On thin slabs the maximum size of coarse aggregate will need to be less than is commonly used on slabs of the usual thicknesses.

Widening

Forms are set on the adjacent shoulder except when lane-at-a-time resurfacing is used. In these cases, forms can be held in place by bracing them to planks held down on the old pavement by sandbags. Pins may also be used and set in holes drilled in the old slab. In this case, off-set brackets have been found useful, as they permit exact form lining in case holes have not been drilled in perfect alignment. Placing and finishing is similar to ordinary concrete construction.

If widening is combined with the resurfacing, the new pavement should straddle the old with equal widening at each edge—generally 2 to 3 feet. Thickness of the widening should be determined according to existing subgrade and the wheel loads to be carried on a free edge or corner. The widening should be constructed integrally with the resurfacing and no longitudinal joint provided over the edge of the old pavement.

For Modern Roads & Streets

Concrete-resurfacing has been proved on both city street and rural road projects. It results in a new road with greater strength. When combined with widening, it means a completely modernized road or street. It can be used on older concrete pavements or on badly worn brick or bituminous pavements on sound bases. Both brick and bituminous surfaces have been resurfaced successfully with concrete without removing the old pavement.



● RESURFACED residential street in Center, Texas.

DIESEL ENGINES SAVE \$20,000 A YEAR ON FUEL

A TWO-ENGINE diesel plant is saving the people of Freeburg, Ill., nearly \$20,000 a year in the fuel bill alone. The anticipated advent of natural gas will increase fuel savings another \$10,000 for these engines are of the dual-fuel type and can operate even more economically on the natural gas.

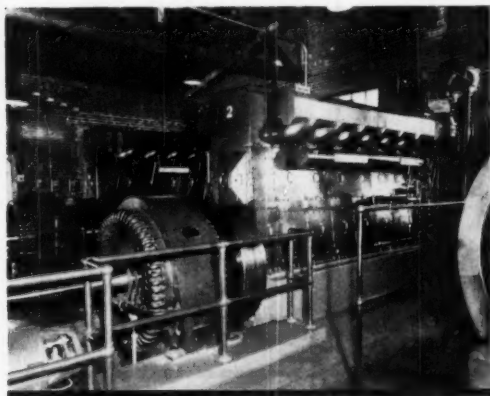
By experience and inclination, this community of 2,000 population 25 miles southeast of St. Louis, is a coal-burning town. Nearby coal

with good efficiency at partial loads. Oil was the best available fuel but a supply of natural gas was expected and it was obviously wise to provide for eventual use of the more economical fuel.

The engines chosen were two

cent. For example, on October 11, 1949 the load varied between a low of 110 kw. and a peak of 330 kw. Yet fuel consumption was kept down to levels considered satisfactory in many plants with far more favorable load factor.

The economic improvement achieved through installation of the diesels is striking. For the nine-month period, production was increased from 996,600 kw.hr. in 1948 to 1,331,760 kw.hr. in 1949, while



● EXHAUST side view of new diesels show the turbochargers. Old steam unit is at right.



● AIR INTAKE filters and exhaust silencers outside of the Freeburg power plant.

mines provide a livelihood for a great many of the residents. Since 1903, power and light have been supplied by a succession of steam engines, the latest of which was installed in 1936. But economic realities can be a powerful force for change and growing deficits convinced the municipality that the steam plant was a liability and that a more efficient power plant had to be provided if rates were to be maintained.

A number of problems influenced the choice of engines. For one thing, the city wanted to keep capital expenditures down by using the old building to house the new equipment. Yet it was necessary to keep the steam plant operating until the diesels were ready. A two-engine plant was indicated. Also, the engineers had seen how rapidly other municipal plants outgrew small engines tailored too closely to current load conditions, and it was determined to purchase larger units

identical turbocharged, dual-fuel Superior diesels of 6 cylinders, 12-in. bore and 15-in. stroke, rated at 690 hp. at 450 rpm. Each drives directly a 485 kw., 3-phase, 60-cycle, 2400-volt generator with 10-kw. V-belted exciter. The engines now run on oil but when the gas line reaches the plant it will be necessary only to push a button to switch over to operation on natural gas.

The diesels were fitted into the plant without disrupting service and took over the full load in December, 1948, after which the steam plant was dismantled. The first nine full months demonstrated both the operating efficiency and the economic soundness of the new equipment. In nine months (the latest figures available at this writing) the diesels produced 1,331,760 kw. hr. while consuming 108,580 gal. of fuel; an average of 12.26 kw. hr. per gallon. The notable fact is that this efficiency level was achieved with an average load of less than 40 per-

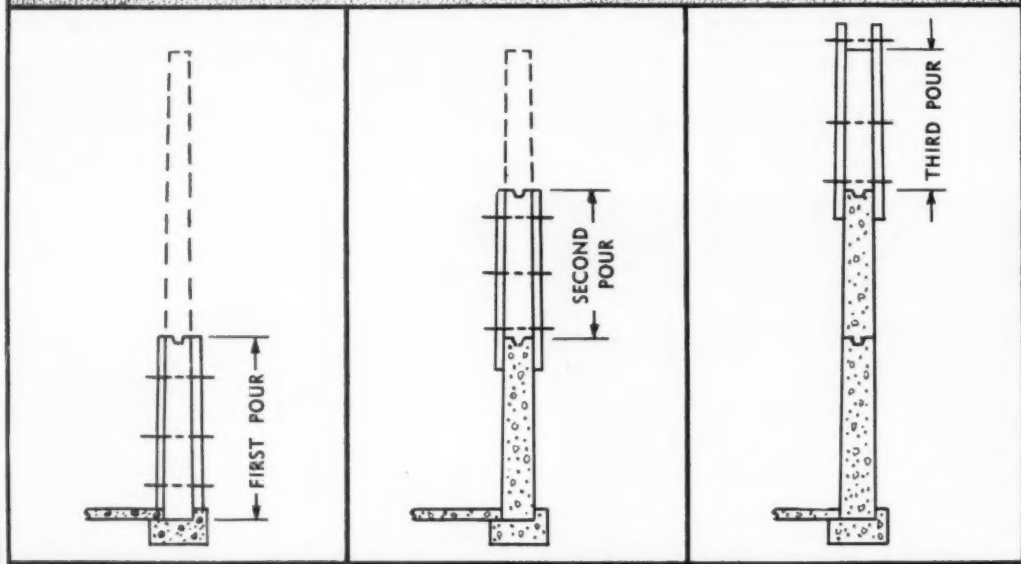
cent. With the augmented revenue and the production economy, a loss of \$6,211.64 in the first three quarters of 1948 was translated into a net operating profit of \$14,111.25 in the like period of 1949.

A comparison of fuel costs is of particular interest. For the 1948 period considered, the cost of coal was \$0.0192 per kw.hr. The 1949 cost of diesel fuel was \$0.0081 per kw.hr., a saving of \$0.0111 per kw.hr. Natural gas should bring the fuel cost per kw.-hr. to less than \$0.003. Further, the load is increasing steadily and improved load factor will mean greater engine efficiency and greater fuel economy.

Diesel fuel is passed through Helco cellulose filters also before reaching the engines. The fuel is delivered from tank trucks into a 15,000-gal. tank and then is pumped through meters and the filters into two 250-gal. elevated day tanks in-

(Continued on page 50)

BUILDING A CONCRETE RESERVOIR WITH SECTIONAL FORMS



● **MAKING the walls:** First pour at left, second pour in center; third at right.

JACK WEGWEISER

Irvington Form & Tank Corp.

AN interesting and difficult forming problem was solved in the construction of a circular reinforced concrete reservoir for the City of St. Johnsville, N. Y. The construction work was done by the Weber Construction Co., Inc., of Schenectady, N. Y. The reservoir is 80 ft. in diameter inside, and 20 ft. 3 ins. high. The inside face of the reservoir is vertical, but the outside face is battered so that the wall thickness at the bottom is 16 ins. and the top thickness only 12 ins. The concrete was mixed 1:2:4, with conventional slump. Pneumatic vibration and hand mauls were used in placement.

Using Atlas "Speed Forms," as shown in the accompanying illustrations, the contractor set up a form assembly for the initial pour. This was 8 ft. high. Wood walers, made up of laminations of 1" x 4" lumber, were laid flat to follow the tank

curve. The outside forms were provided at about 6-ft. intervals with wood wedges and removable shims. These were so arranged that, after the initial pour, the forms could be raised in panels about 6 ft. wide and reset for the subsequent lifts, utilizing the tyscrews originally provided for the lower 8-ft. pour.

Construction Procedure

By removing the shims from the outside forms, it was easy to set the forms in proper position for the second pour, and to maintain the required batter of the outside surface. After the second 8-ft. lift had been poured, it was easy to repeat the same procedure for the third or top lift. The form crew consisted of 8 men. Block and tackle were used for lifting the panels.

The form-ty system consisted of standard tyscrews which provided the advantage of a strong threaded bolt to hold the form panels in place for consecutive lifts by using either bearing blocks to support the panels

or by bolting directly through the forms to hold them in place (using the regular form-ty holes).

The concrete operations on the tank wall started August 20 and were completed September 24. Since there were 4 rainy work days the entire tank was concreted in one calendar month.

Since the design called for conventional reinforcing rods it was permissible to have horizontal construction joints. Advantage was taken of this fact by providing only sufficient forms for one ring 8' 0" high. This ring was then re-erected and used on the next stage. By this method the contractor was able to rent one set of forms and get three full uses from them on the one tank.

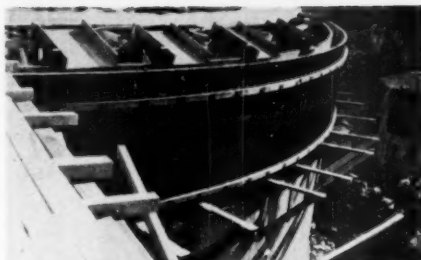
Concrete was delivered in transit-mix trucks, dumped into wheelbarrows pulled over a ramp and then over the buggy-runs to the various pouring chutes radially located around the form circle. The buggy-runs were placed on the scaffolding erected within the form

circle. This scaffolding had four functions: 1) Inside bracing for the forms at the different lifts; 2) support for the dome form; 3) support for buggy-run and pour chutes; and 4) support for the outriggers used to hold the block and tackle that hauled up the forms.

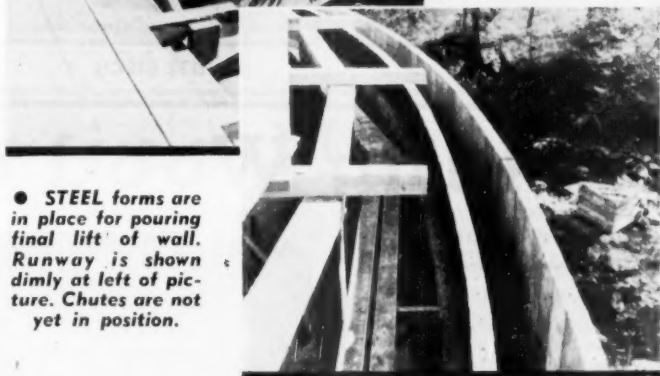
This method of tank forming is applicable to reinforced concrete tanks of any diameter and height combination.

Where the concrete tank wall is of conventional reinforcing rod design the Atlas forms can be used, starting with a lower full circumferential ring, for as many lifts as the height of the tank wall dictates. To insure complete water tightness at the joints an easily placed water stop is set into the top of each completed pour while the concrete is still fluid. This provides a tight connection between lifts.

When a prestressed tank wall is called for, the Atlas forms are set up in segments of the tank circumference for pours which are the full tank height. After each segment is poured the forms are stripped in full height panels and immediately re-erected. This results in a number of vertical construction joints around the tank wall, usually 25 to 30 feet apart. This is of little importance since the application of the prestressing steel so squeezes the concrete together at the joints as to eliminate leakage at those points. Examples of tanks constructed with Atlas Speed Forms by this method may be seen at the Hyperion sew-



● **LEFT:** Forms in place for final pour. Approach runway in foreground; circular runway at top, with pouring chutes for placing concrete.

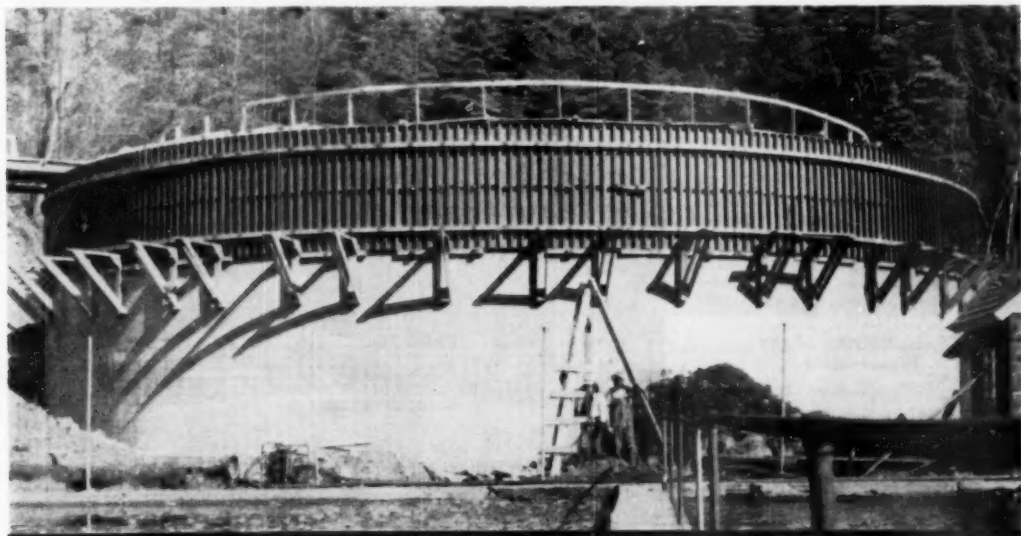


● **STEEL forms** are in place for pouring final lift of wall. Runway is shown dimly at left of picture. Chutes are not yet in position.

age treatment plant at Los Angeles, California; at the Northeast sewage treatment plant at Philadelphia, Pa. and currently at the Oklahoma City sewage treatment plant now under construction.

The writer, who is sales engineer for the Irvington Form & Tank Corporation, collaborated with R. E.

Weber, president of the Weber Construction Company of Schenectady, N. Y., in working out the above described forming method. Donald Cockburn was Superintendent for the Weber Company. Consulting Engineer for the City of St. Johnsville was Morrell Vrooman of Gloversville, N. Y.



● **FORMING** in place for third-stage pour, showing bracing and guard rail at the top. The pic-

ture at the top of this page shows further details; and drawing opposite the three stages.



IRON WOOD



WHITE BIRCH



GREEN ASPEN

Making Wood a better

JOHN G. HAMMOND

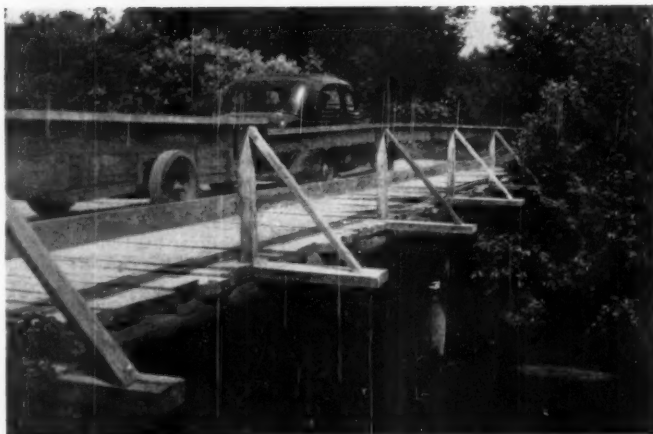
Dow Chemical Co., Midland, Mich.

WITHOUT perceptible change in its outward appearance or odor, chemistry has given wood a new set of characteristics. Even the poorer species of woods can now be made resistant to decay, insect attack and moisture when chemically treated with newer formulations. Treated wood from "weed" trees may be found as serviceable for many jobs as wood from select species.

Recognized over a hundred years ago, the basic chemical ingredient for these new wood preservative formulations has been rigorously tested and is now a standard of the American Wood Preservers Ass'n. (P8-49); and of the Army, the Navy, the Joint Army-Navy, the Civil Aeronautics, the Federal (TT-W-570), the USDA, and many state and municipal specifications. Research has shown it to be up to 100 times more toxic to the decay test fungus organism (Madison 517) than the standard test control. At the same time, this preservative is extremely repulsive to wood-destroying insects, including termites, powder post beetles and carpenter ants.

Characteristics of the Preservative

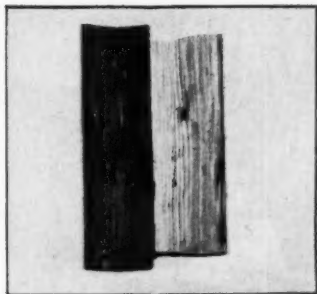
The basic ingredient is pentachlorophenol—penta, for short. This chemical is a grayish brown crystal which is practically insoluble in water, but soluble in petroleum and other oils. It has a very low vapor pressure, so that it does not evaporate readily in service. These various characteristics make it useful over a wide range of wood preserv-



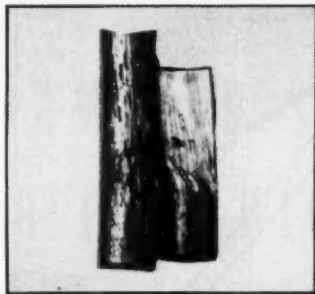
● **WOOD** continues to be much in evidence in many structures.



● **LIGHT** treatment on bench; dark treatment on bridge guard rails in rear. Both types are now available.



ASPEN



RED PINE



RED OAK

Engineering Material

ing functions. Chemists have formulated penta with heavy, medium and light petroleum oils to make preservatives having almost any desired viscosity and suitable for many uses.

Somewhat similar in viscosity and appearance to creosote is the Chapman Penta 201. This is recommended for the treatment of poles, piling to be used in fresh water, timbers in contact with the ground and not requiring painting, bridge timbers, docks, outdoor platforms, and similar structures. Penta 205, which is suitable for all of the above uses, can be used also for treatment of lumber where a clean, light-colored surface is desired. Lumber treated to 4 pounds per cu. ft. retention with 205 can be painted very shortly after treatment.

Consolidated Treating Co. produces treated poles that have a specially pleasing appearance. These are treated without pressure. However, Douglas fir cross-arms are difficult to treat except by penta pressure methods or by the hot-cold bath process.

Water Repellency

Some formulas contain water repellent resins which make the finished surface efficient in resisting rain, melted snow and dampness from humid air. Architects have found that they can use treated wood sash and doors without danger of warp or dimensional changes. By using proper formulations, boats will not waterlog, floating docks in swimming pools will not check, and maintenance on picnic benches, diving equipment and pavilions is greatly reduced.

Tool handles that have been placed in the preservative for 3 to 5 minutes are sufficiently protected to last many times longer than they would otherwise. Shovel handles often break because water has accumulated in the ferrule or handle socket and started decay. Ladders treated with penta remain safe

The Austin Co., constructors, say they have used individual pieces of treated plywood for concrete forms as many as 25 times. When treated with the water repellent penta formulation, plywood produces a smooth and even concrete surface. The resinous finish on the plywood lubricates the concrete just enough



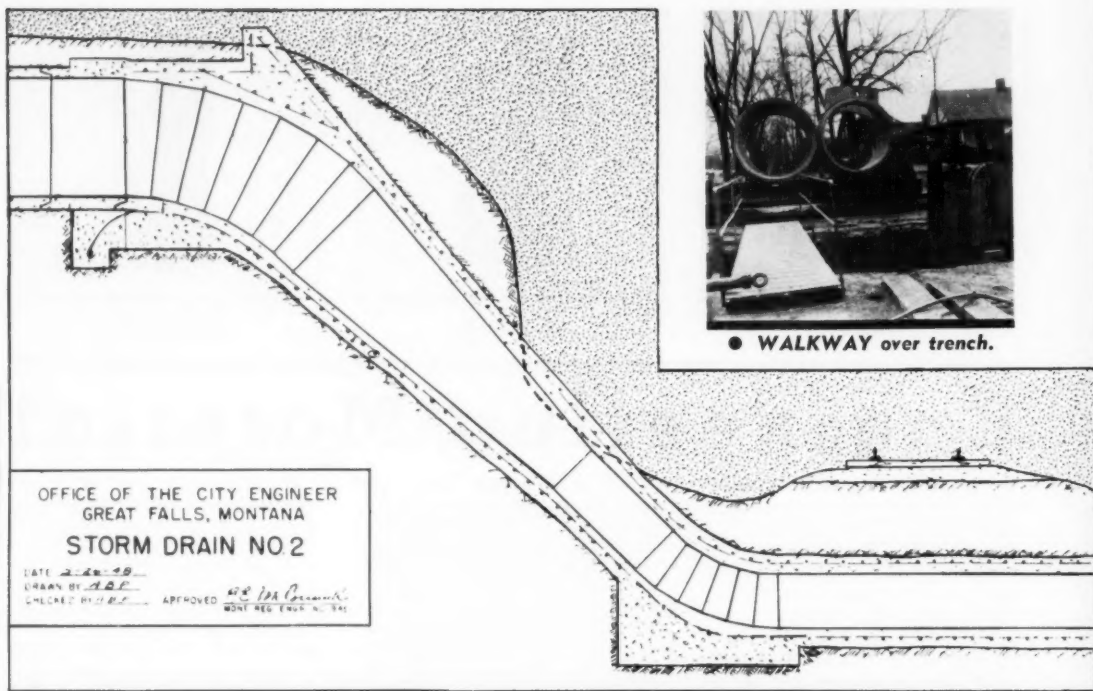
Courtesy American Forest Prod. Ind.

● PINE poles have been shaped and are ready for treatment.

longer. Cook & Co. make ladders so treated to prevent rotting in the rails and at the ends of the rungs. Scaffolds are usually made of expensive lumber. To increase safety and provide longer life, scaffold timbers should be treated with a water repellent preservative formula containing 5% of pentachlorophenol, or with the Permatrol formulation.

to prevent cement particles from setting on and adhering to the surface. Carpenters say that treated plywood that has been used for concrete forms is so free of abrasives that it can be sawed without dulling cutting equipment. Exterior forms were used for roof construction after the concrete had set.

(Continued on page 48)



● WALKWAY over trench.

A. J. RICHARDSON
Assistant City Engineer, Great Falls, Mont.

A CONSTRUCTION program, costing \$1,300,000, to provide adequate storm and sanitary sewers, is nearing completion in Great Falls, Mont. Long needed to relieve the growing pains of the city, our program was conceived during the war and was developed as a prominent post-war planning project. In 1946, Black & Veatch, consulting engineers of Kansas City, Mo., were engaged to develop a feasible plan for sewerage, both storm and sanitary, for the entire city.

Planning funds had been made available through the Federal Works

Agency's Bureau of Community Facilities. The Engineer's Office was aided in obtaining these funds by Wm. J. Wenzel, who became Director of the newly created Department of Public Works in May, 1947, and exercised his engineering ability in working out the general design of the projects. However, it fell to R. E. McCormick, who was appointed City Engineer in January, 1948, to push through to completion the plans and specifications for actual construction. The various problems involved in the design made this the most interesting job accomplished by the City Engineer's Office in recent years.

The City of Great Falls covers an area of 5,760 acres, of which about 280 acres is water surface. The Missouri River flows through the city, accounting for this water surface and dividing the city into an "east side" and "west side" which topographically, are two quite dissimilar sections. To the planners, the principal concern on the east side was the storm sewerage, while on the west side the most pressing issue was to provide a sanitary sewer trunk for a portion of the residential area in the northwestern portion of the city and for a large suburban area in the southwestern part. On the east side the only "separate" storm sewer



● TRENCHING with backhoe on 15th St.

trunk was the Valeria Way Storm Sewer, approximately 2½ miles long, and the only storm drainage service for an area including more than two-thirds of the 3,855 acres east of the river.

Studies showed that extension of street paving and storm sewer laterals in this eastern area would quickly overtax the capacity of this line. The remainder of the east side, including some of the most completely developed residential areas in the city, as well as a small part of the business district, depended upon a combined system of sanitary sewers and storm drains. This system had been found inadequate on numerous occasions during periods



● WET CLAY and sand required heavy 3" sheeting.

HOW STORM AND SANITARY SEWER PROBLEMS WERE SOLVED

of intense, but short rainfall. At such times storm water and sewage would back up into the basement floors of the buildings. It was apparent that further development of storm sewer laterals in this area would aggravate this situation, so the establishment of a separate storm sewer system for the area appeared mandatory. The two systems of sanitary sewers on the east side, however, were found to be adequate if divorced from any considerable amount of storm drainage.

The situation was almost reversed on the west side. Although there was a need for expanding both storm and sanitary sewer systems on the west side, it was decided that lateral development along existing storm sewer trunks could correct any considerable deficiency in storm drainage. However, the construction of a sanitary sewer trunk line to serve the extreme northwest portion of the city, and the rapidly developing suburban area of the southwest portion, had become a necessity in order to meet health and sanitation requirements. This suburban area is tributary to the Sun River and storm drainage can be provided by relatively short drains discharging into that river. Disposal of sanitary sewage, however, required more study.



● **OUTFALL** shown in drawing.

In their report, Black & Veatch submitted a study of the disposal of sanitary sewage, approached from the broad viewpoint of oxygen balance. In this study they concluded that the pollution of the Missouri River by discharging into it the raw sewage from the sewerage systems of Great Falls was of a degree considerably below contemporary limits of permissible pollution. This line of reasoning was followed in designing the West Side Sanitary Sewer to discharge directly into the Missouri River just below the mouth of the Sun River. However, a site 100' x 370' was purchased adjacent to the outfall for the future location of a sewage treatment plant.

In designing the sewers to meet the foregoing needs, the main project developed into three separate projects and included: (1) Storm Drain No. 1—a storm sewer on 7th St., from Central Ave., northward, to the Missouri River; (2) Storm Drain No. 2—a storm sewer running northward and westward across the city to the Missouri River at the foot of 15th St.; and (3) the West Side Sanitary Sewer—a sanitary sewer trunk line running south and west, then turning east to discharge into the Missouri just below the mouth of Sun River.

What These Projects Required

The quantities included in these projects indicate the extent of construction. On Storm Drain No. 1, major items included: 1,415 ft. of 60-in., 1,600 ft. of 48-in. and 1,210 ft. of 42-in. reinforced concrete pipe; thirteen 48-in. manholes from 6 to 26 ft. in depth; and 215 ft. of 15-in., 520 ft. of 12-in., and 375 ft. of 10-in. standard concrete pipe. The total of excavation was 18,221 cu. yds., of which 3,811 cu. yds. were rock.

On Storm Drain No. 2, the following were included: C75-41 reinforced concrete pipe, 2,119 ft. of 78-in., 3,476 ft. of 66-in., and 1,078 ft. of 60-in.; C76-41 reinforced concrete pipe, 72 ft. of 78-in., 1,762 ft. of 72-in., and 102 ft. of 60-in.; and 1,605 ft. of standard pipe. Inlet pipe totalling 3,040 ft., 6-in. to 18-in. There were 23 manholes, from 8 to 24 ft. deep. Of 50,665 cu. yds. of excavation, 10,156 cu. yds. were rock.

On the West Side Sanitary Sewer, the estimate included: 21,888 cu. yds. of unclassified excavation; 500 cu. yds. of rock excavation; 48 manholes 6 to 20 ft. in depth; vitrified clay pipe as follows: 1,222 ft. of 8-in., and 2,214 ft. of 10-in.; concrete pipe as follows: 4,829 ft. of 15-in. and 8,685 ft. of 30-in.; and 1,530 ft. of 8-in. Transite force main. One lift station was required. This used a 250-gal. duplex sewage ejector utilizing the Fuller C-24 rotary compressor with a 220-volt, 3-phase, 10hp. motor.

Designing the Storm Sewers

Determination of storm sewer capacities, indicated by the pipe sizes shown in the quantities listed above, was arrived at by a study of rainfall intensity-frequency data provided by the U. S. Department of Agriculture; and of run-off factors pertinent to the particular areas tributary to the storm sewers, including the character of the soil, slope and character of the surfaces, and the length of the storms. The

records indicated that, in this particular area, the probability of intense rainfall for periods of more than thirty minutes is rather remote. This probable occurrence of intense rates of precipitation for relatively short periods of time was accepted as the logical basis for calculating the rate of run-off and this in turn as the basis for determining the needed sewer capacity. Study of the conditions affecting street run-off in the city indicated that it requires about 25 minutes, in the developed portions of the city, for the storm water to concentrate, flow over the surface, and reach the storm sewer connections in volume. In view of these facts, the expectancy of storms of thirty minutes duration was particularly pertinent to the problem at Great Falls.

Records of the maximum storms in 2, 5, 10, and 25-year periods show that the intensity of rainfall to be expected increases with the time period; and, since, the design of sewers must be based on expected run-off, the question resolved itself into determining the class of storm for which storm sewers could be provided economically. Rainfall intensity curves prepared by Black & Veatch showed that rates of intensity for storms of 30 minutes duration ranged from 1.8 inches per hour for the 25-year storm to 1.0 inch per hour for the 2-year storm. Run-off coefficients provided in their charts indicated, for a 30-minute period, a 12% run-off in areas with pervious street surfaces and 72% run-off for impervious surfaces. The run-off in cubic feet per second per acre, for a 30-minute period was shown to vary, on pervious surfaces, from 0.12 cu. ft. for the 2-year storm to 0.22 cu. ft. for the 25-year storm, and, on impervious surfaces, from 0.64 cu. ft. for the 2-year storm to 1.28 cu. ft. for the 25-year storm.

Due to the short duration of storms in this area, the total amount of rainfall for any storm is relatively small and it seemed reasonable to believe that excess run-off from any storms of greater intensity than those of two-year frequency, could be carried in the streets without appreciable flood hazard. Furthermore provision for storms of 5 and 10-year frequency would involve 20% to 30% increases in construction costs. For these reasons, the storm sewers were designed to carry run-off to be expected once in two years.

Funds for the construction were obtained through the sale of revenue bonds, approved by the voters when the proposal was placed on the bal-

lot in the election on Nov. 4, 1947. The bonds were issued on July 1, 1948, and are being retired through a system of surcharges upon water-bills charged to the users in the city. Following the balloting in favor of the projects, the pressure for the reality of construction increased and the tempo of the designing and preparation of the plans was stepped up. During the spring and summer of 1948, bids were called for on the three projects.

The contract for Storm Drain No. 1 on 7th Street was awarded to Utility Builders, Inc., a Great Falls construction firm headed by E. H. Blakeslee, whose bid was \$273,972.85. The low bidder on Storm Drain No. 2 was another Great Falls firm, Anderson & Millensifer, Inc., who bid \$723,824.50. Affiliated with them in the construction of this storm sewer was a local construction firm, Robertson & Cave, Inc. On the West Side Sanitary Sewer, the contract was awarded to the Dudley Construction Co., of Great Falls, who entered the lowest bid of \$268,881.61. The reinforced concrete pipe on these was furnished by two plants located in Great Falls, the Elk River Concrete Products Co., affiliated with the Cretex Companies, Inc., and the Montana Concrete Pipe Co., makers of Warren's Concrete Products.

Construction began on the storm sewers in August, 1948, and on the sanitary sewer in January, 1949, the work continuing on all the projects throughout a very severe winter. The contractors encountered solid rock, clay and shale, heavy wet gumbo, ground water, and running sand or quicksand. Trench cuts varied from 8 feet to 26 feet. Frost penetrated 5 feet into the ground, necessitating blasting, and the men worked in 15° below zero temperatures. During this extreme weather the contractors maintained a tight, close-knit operation which kept moving ahead and when the first heavy spring rains came the storm sewers were ready for it throughout the greater portion of their length. Then the people of Great Falls had the pleasant experience of watching the new sewers carrying away the storm waters, and pedestrians walked without splashing through intersections which, in previous years, had been small lakes during each rain-storm.

The projects are almost completed. On the West Side, the problem of sanitary sewerage is being answered for an extensive residential area, and, on the east side, storm drainage is no longer a recurrent, frustrating complaint.

Versatile INTERNATIONAL

Power On Wheels

When you have loads to be moved—whenever pulling, pushing or carrying tasks confront you—it's time to put International tractors to work.

Saving time, saving labor and saving money, International wheelers pay for themselves through the many jobs they do so well, so dependably and cheaply.

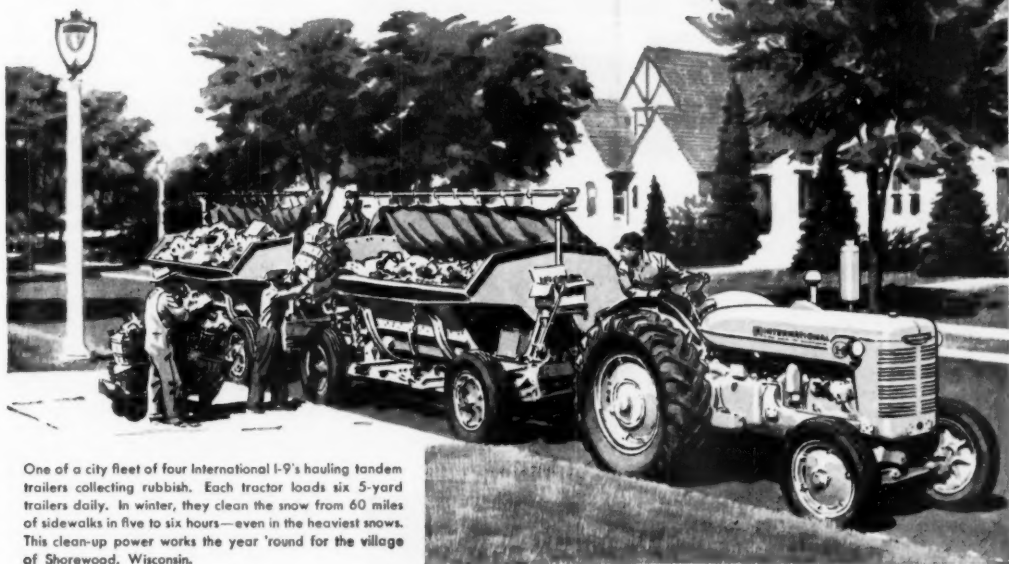
Equip them with front-end loaders or bulldozers for materials handling and dirt moving or digging . . . with snow plows or rotary brooms for clearing and cleanup jobs . . . with cranes for lifting and carrying, stockpiling and handling . . . with winches

for line pull or pulleys for belt power . . . or with mowers for weed control, parkway maintenance and grass cutting . . . and take full advantage of International wheel tractor versatility.

Seven models, two of them diesel powered, are available with matched equipment and all accessories from International Industrial Power Distributors located in major market centers throughout the country. Write for the name and address of the distributor serving your community.

INTERNATIONAL HARVESTER COMPANY
Chicago

Tune in James Melton and "Harvest of Stars"—NBC, Sundays



One of a city fleet of four International I-9's hauling tandem trailers collecting rubbish. Each tractor loads six 5-yard trailers daily. In winter, they clean the snow from 60 miles of sidewalks in five to six hours—even in the heaviest snows. This clean-up power works the year 'round for the village of Shorewood, Wisconsin.

**Standardize
on Power
that Pays**



INTERNATIONAL

INDUSTRIAL POWER

CRAWLER TRACTORS • WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

When writing, we will appreciate your mentioning PUBLIC WORKS

SPECIFY *Scott's* THIS SPRING FOR LAWNS THAT ARE REALLY BEAUTIFUL

A sparkling green lawn adds an inviting, well kept appearance to public buildings, schools, plants, parks, athletic fields, highways and of course to homes. You can be certain to achieve this lawn perfection by sowing **Scotts SEED**, feeding with **TURF BUILDER** or easily clean up weed infested old lawns with **Scotts WEED and FEED**. Scotts has a nation wide reputation for producing thick, velvety turf with less effort . . . and best of all, **Scotts** lawns cost no more than the ordinary kind. Plan now to specify **Scotts Lawn Care Products** for all grassed areas. Our soil and turf technicians are at your disposal to help you with any turf problem.

O M Scott & SONS CO., 67 Spring St., Marysville, Ohio
Also Palo Alto, California

FREE . . . 2 year subscription to **Lawn Care**, tells how to build and maintain year 'round lawn beauty. A deluxe ring binder for filing each issue along with a review of 107 back editions, \$1.00 postpaid.

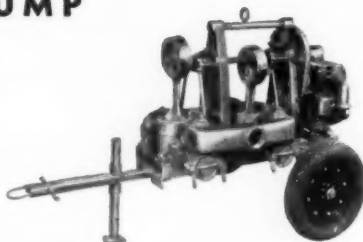


NOVO QUALITY EQUIPMENT FOR FIFTY-NINE YEARS

A NEW PUMP

- DOUBLE DIAPHRAGM
- DOUBLE CAPACITY
- DOUBLE DUTY

Handles twice the amount of muddy, or sand and debris-laden water as does Novo's well-known single diaphragm model. Write or wire for specifications on this new pump.



WRITE FOR NEW BULLETINS

ON THE NOVO TO FIT YOUR NEEDS



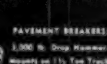
SELF-PRIMING PUMPS
1 1/2" to 6"
3,000 to 90,000 G.P.M.



PRESSURE PUMPS
Siphons or Boosters
750 7.5 G.P.M. to 94 G.P.M.



HOISTS
Single or Double Drum
1,000 to 8,000 lb. Line Pull



PAVEMENT BREAKERS
3,000 lb. Drop Hammer
Mounts on 1 1/2" Tack Truck



DIAPHRAGM PUMPS
3" or 4" Single or Double
3,000 to 10,000 G.P.M.



ENGINES
Air-cooled, 4 to 8 H.P.
Water-cooled, 10 to 32 H.P.

NOVO ENGINE COMPANY, LANSING, MICH.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

Wood

(Continued from page 43)

All sash and door manufacturers can furnish their products pentatreated. Not all lumber companies are yet in a position to furnish treated lumber, but many moderately sized cities have at least one lumber company equipped to furnish treated lumber.

Equipment for Treating With Penta

It does not require much equipment to treat lumber satisfactorily for ordinary building purposes. The principal requirement is a dip tank, which can be made from galvanized iron sheets, reinforced with timber and with soldered seams. Such tanks should be provided with a sloping drain board so the excess material can drain off into the tank. A small hoist for handling the timber is convenient but not necessary. Synthetic rubber gloves and aprons should be worn; it is not advisable to let the solvent come into contact with the skin.

Rough lumber that will be in contact with damp masonry or the ground should be soaked for 3 or more hours. To test the penetration, put pieces of scrap lumber into the tank and note the penetration into the cross-section by sawing into them. A quarter or a half inch penetration is enough, but do not judge by the ends. These absorb the formulation more readily than the sides.

Large jobs require the services of a commercial treater. There are more than 200 pressure treaters in the country, and about 10% of them are now equipped to treat with penta. However, any plant using either pressure or soaking equipment can be used. It is necessary only to clean out the tanks and put in the penta solution.

Pentachlorophenol, as already stated, has been approved by the American Wood Preservers Association. Petroleum oils for use as vehicles for pentachlorophenol have also been approved by the Association as Specification P9-49. Oils conforming to this specification may be dark colored and heavy for treatment of items not requiring painting, such as heavy construction timbers, fence posts, loading docks, etc.; or may be lighter colored where non-staining or paintable treatments are required. This possibility of selection of oils commensurate with end-use requirements gives pentachlorophenol an unusual versatility.



There's No Substitute

for **BOWSER**
ESTABLISHED 1885

DIATOMITE FILTRATION

Bowser water filtration systems for swimming pools are unsurpassed in producing brilliantly clear water. They use only 1/10 the usual backwash water and occupy only about 1/10 the usual floor space.

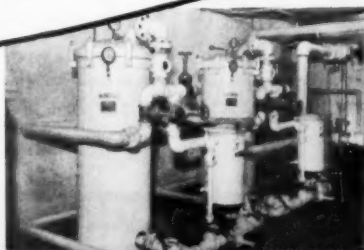
Algae growth is effectively checked. Removal of a high percentage of bacteria makes sterilization methods more efficient and easier to control.

Bowser operating cost is lower!

Write for your copy of "The MODERN WAY to filter swimming pool water."

Dear Jane,
Gee, I wish you were here! I've just had the kindest swim in our new municipal pool. The water is so crystal clear and sparkling I could stay in all day. All the gang says it's so much more fun to swim in water that looks clean enough to drink!
Dad says it's all because of the Bowser Water Filtration System. It's a Chemical engineer (as if you didn't know) and really knows his stuff.
You may find it hard to believe, but he says all the water in the pool is completely filtered every six hours. When you come for your promise swim every day! I can promise you'll be spoiled for swimming in any pool that doesn't have a Bowser.
I can hardly wait to see you!
Write soon. Love, Mary
P.S. Why don't you have your dad suggest Bowser filters for your City pool? He'll be doing the swimmers a big favor!

Typical Bowser system serving a 176,000 gallon pool.



BOWSER, INC., 1395 Creighton Avenue, Fort Wayne 2, Indiana

Freeburg Diesel Engines

(Continued from page 39)

side the plant. Flow to the engines from the day tanks is by gravity.

Air for the engines is drawn through an air-maze two-element viscous-impingement filter outside the building and is sent to the cylinders under pressure by the exhaust-driven turbocharger. Exhaust gases then vent through Maxim vertical silencers outside.

Principal elements in the closed cooling system are two Marlo evaporative coolers and two motor-

driven centrifugal circulating pumps. Thermostatically-controlled shutters on the coolers keep jacket water at specified temperature. Normally one cooler and one pump are used for each engine but the piping permits alternate or combined use of pumps and coolers. City water is treated in an Elgin softener before it is used for makeup.

Beside each engine is a control panel with exhaust pyrometer and alarms on engine lube pressure, turbocharger lube pressure, jacket water temperature, and overspeed. On each engine are additional gauges and a tachometer.

PUBLIC WORKS for March, 1950

Distribution is still handled from the old switchboard but two new engine panels and a swinging synchronizer panel were installed with the diesels. The modernization program calls for eventual replacement of the old board.

Starting air is supplied by two Quincy compressors, one driven by motor, the other by a gasoline engine. The first is controlled automatically to keep 200 to 240 psi. pressure in the air tanks.

Normal operating procedure is to run one engine for a full week, then switch to the other for a week. The reserve engine provides complete standby protection. The engines are large enough to allow for substantial load expansion and there is room in the plant for additional units when the need arises. Despite the initial unfavorable load factor, Freeburg's diesels have proven their value.

The plant is operated under the immediate supervision of Cornelius Nold, Superintendent of the Light, Water and Sewage Department. Major policy matters are determined in consultation with Village President Louis M. Schwalb and the six-man Board of Trustees. The business office is managed by Village Clerk Robert Browning.

Battle Creek, Mich.

(Continued from page 29)

In it, the engineers have worked with the Department of Public Works. It is expected that the comprehensive study will be completed sometime prior to July 1950.

During the period described above there has, of course, been considerable progress made on other work, such as sewer construction, both storm and sanitary; flood control; long range water system improvements; and repairs to existing buildings. The Department of Public Works has also designed and constructed many recreational facilities including a night lighted baseball field in one of the larger parks, and complete beach house facilities, handling 5,000 people, at one of the near-by lakes. All of these activities and projects will be described in additional articles to follow. Meanwhile the Engineering Division of the Department of Public Works, working with the Michigan State Highway Department, arranged for an external traffic survey which will be used in conjunction with the study being made by Harland Bartholomew and Associates. This study includes many volume counts taken by the Highway Department at heavy traffic intersections.



METER INSTALLATIONS WITH FORD YOKES

Rigid, constant spacing of the Ford Yoke makes meter setting and changing surprisingly easy. Inlet and outlet pipes are permanently connected and aligned even when meter has been removed. No dangerous yanking or twisting of pipes is ever necessary. The simple expansion connection needs no wrenches yet makes a tight, trouble-free meter installation. When meter is removed, the expansion fitting stays with it, making water stealing quite impractical.

Ford Yokes are made in three types, Riser Yokes, Angle Yokes and Straight Line Yokes. All are equipped with proper fittings and gaskets. In ordinary usage, they last a lifetime.

Send for Complete Ford Catalog No. 50

FOR BETTER WATER SERVICES

THE FORD METER BOX COMPANY, INC.

Wabash, Indiana

FORD

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

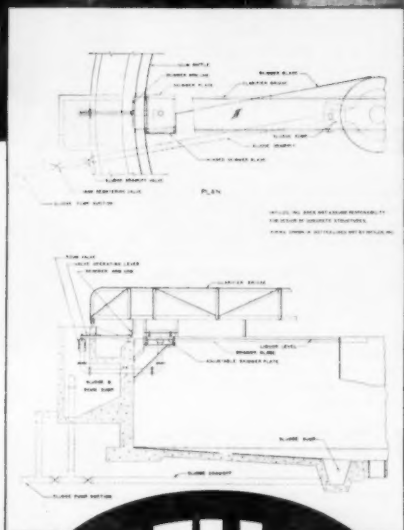


ODESSA, TEXAS, INSTALLATION OF INFILCO AUTOMATIC HYDRAULIC SKIMMER

Controlled Currents Remove Scum this New and Better Way!

INFILCO'S Automatic Hydraulic Skimmer introduces a *new principle* in scum removal. Now, the use of *controlled currents* brings a new high degree of efficiency to the disposal of surface scum in primary clarifiers. The heart of the scum remover is the scum discharge pipe which fits into the center of the skimmer plate located just below the liquid surface. Here, controlled currents are set up to remove surface scum. Removal occurs automatically once during each revolution of the sludge scraper assembly.

WRITE TODAY for Bulletin No. 5 6000. It gives all the interesting facts concerning this *better* scum remover. Also complete information about Inflico's "quiescent clarification" . . . the ultimate in effective sedimentation and sludge removal.



INFILCO INC.

GENERAL OFFICES: 123 WEST 12TH PLACE • CHICAGO 16, ILLINOIS
SALES OFFICES IN TWENTY SIX PRINCIPAL CITIES

WORLD'S LEADING MANUFACTURERS OF WATER CONDITIONING AND WASTE TREATING EQUIPMENT

When writing, we will appreciate your mentioning PUBLIC WORKS

4

important facts that you should know about swimming pools

If you are charged with responsibility in connection with the swimming pools of your community, you know that proper health standards must be maintained. The time to insure proper hygiene and safety for bathers, to provide a constant supply of clean water and correct drainage, and to secure maximum service from your pools is before you start construction. Make sure that these four facts play a prominent part in your pool plans:

1. THE POOL WATER AND CONTENTS SHOULD ALWAYS BE COMPLETELY RECIRCULATED

The Josam Injector Nozzle and Scum Guttering Supply Fittings guarantee continuous recirculation of over 90% of pool water, thus eliminating the possibility of "dead spots."

2. THE POOL SHOULD BE SAFEGUARDED AGAINST UNSATURATED CONDITIONS

Josam Promenade and Scum Gutter Drains accumulate and retain debris, preventing foreign matter from clogging lines and fouling equipment.

3. THE DRAINAGE SHOULD BE ADEQUATE, YET COMPLETELY SAFE

Josam Main Outlet Drains eliminate dangerous suction by allowing water from pool to drain slowly, but in sufficient volume to completely drain pool in 4 hours or less.

4. THE POOL DESIGN SHOULD COMPLY WITH MODERN STANDARDS OF HYGIENE

You can meet modern standards of both hygiene and recreation by consulting local Architects or Engineers, and mailing the coupon below for Josam Manual SP on the latest facts and information covering water recirculation and drainage.

JOSAM MANUFACTURING COMPANY
MAIN SALES OFFICES, JOSAM BLDG., CLEVELAND 13, OHIO
MANUFACTURING DIVISION — MICHIGAN CITY, INDIANA

Representatives in All Principal Cities

JOSAM MANUFACTURING CO.

335 Josam Bldg., Cleveland 13, Ohio

Please send me free copy of Josam Manual SP.

Name

Firm

Address

City and State



Josam Series 0700-B
Injector Nozzle
with recirculation feature



Josam Series 0490
Main Outlet Drain



Josam Series 0670-B
Scum Gutter Drain
with Sediment Bucket



When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

Public Works ENGINEERING DATA

Maintenance Cost Breakdown

It cost \$152.90 per mile to maintain the road system of Frederick Co., Md., according to a report by R. H. Willard, County Engineer, at the recent Highway Research Board meeting. This cost was broken down as follows: Surface maintenance, 53.3%; drainage 15.6%; grading 15.8%; snow and ice control 8.4%; and maintenance of bridges and signs 6.9%. Maintenance is also broken down as follows: Labor 45.5%; materials 34.4%; and equipment 20.1%.

Costs—Fourth Quarter of 1949

Average bid prices for Federal-Aid highway construction for the fourth quarter of 1949 are reported as follows: Common excavation, 35¢ per cu. yd., compared to 38¢ for the preceding quarter and 43¢ for the 1948 average. Concrete pavement, \$3.60 per sq. yd., compared to \$3.56 for the preceding quarter and \$3.63 for 1948 average. Structural concrete, \$44.38 per cu. yd., compared to \$47.21 for the preceding quarter and \$51.00 for the 1948 average.

Reducing Water Consumption in England

"The extraordinary dry weather of last winter and this summer has created a shortage of water supplies in most of those undertakings which rely on surface waters for their sources of supply. Underground sources may yet also be affected, but the quantity of water in stock is more difficult to assess."

This was written, not by an American waterworks superintendent but by an English one, in an article in the English periodical "The Surveyor".

The water department of Tynemouth (population 97,000) appealed to the public to save water, with little effect. Shutting off the supply at night saved only 5%—consumers filled receptacles each afternoon, and next morning threw away what had not been used. Moreover only those in the higher parts of the city were affected. Shutting off the supply in the day would cause maximum inconvenience to trades and industries. They tried enlarging the lower zones, partly closing valves on the distribution mains, and partly closing curb stops. The first two were ineffective, as they left the higher residences with no water. The third proved very effective and saved 50% of the domestic supply. The inspectors worked in pairs, one man opening a faucet on the ground floor while the other closed the curb cock until the faucet flow was cut to "pencil thickness." In this work ten inspectors worked from 8:30 A.M. to 10 P.M. ("with breaks for lunch and tea") seven days a week for five weeks. This kept all mains full for fire fighting.

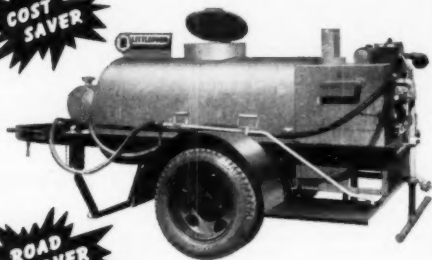
THERE'S 3 DEFINITE REASONS WHY YOU NEED THIS LITTLEFORD TRIPLE ACTION No. 101



Model No. 101
Utility Spray Tank using Hand Spray
for Patch Work.

This Littleford No. 101 Utility Spray Tank is not only a Time Saver, Cost Saver and Road Saver, but it is a combination of three units rolled into one. It has a Spray Bar for small application jobs, a Hand Spray for patch work and a Pouring Pot Outlet for crack filling work. When the Littleford No. 101 is on the job, the road maintenance crew can do almost all road repairs with this one piece of equipment. The 101 is efficient in operation, saves time and money, its use on Roads, Streets and Highways saves our transportation system. Be modern, use Modern Littleford Equipment.

**COST
SAVER**



**ROAD
SAVER**

MANUFACTURERS OF

"Tanker" Steam Heaters
"Kwik Melters" Roofers Kettles
Trail O Rollers

"Spray Master" Pressure Distributors
Highway Brooms
Trot Heaters
Trail O Distributors

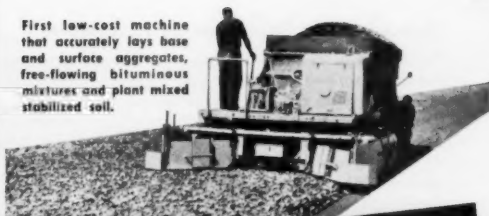
Asphalt Supply Tanks
No. 101 Utility Spray Tanks
M-HD Asphalt Kettles



LITTLEFORD

LITTLEFORD BROS., INC.
452 E. Pearl St., Cincinnati 2, Ohio

First low-cost machine
that accurately lays base
and surface aggregates,
free-flowing bituminous
mixtures and plant mixed
stabilized soil.



IT'S HERE! Jaeger self-propelled aggregate spreader

Accurately Lays up to 10" Thickness, 8 to 12½ Ft. Widths: Four-wheel drive operates entirely on subgrade or compacted base—prevents displacement of newly-laid material. Long straightedge runners carry screed independent of up-and-down machine motion, average out subgrade irregularities, positively maintain correct course thickness.

Quick Width Changes: 10' to 12½' by telescopic shaft, screed inserts. Block off for 8' to 10'.

Blends Perfect Joints Between Lanes with blender wings and side control gates. Saves hand work.



Tandem Spreaders Lay Full-Widths up to 25', Ready to Roll in One Operation: Two spreaders cost much less than one big bituminous paver, double your daily production of base, permit earlier application of top and keep your higher priced paver busy finishing top course—at tremendous savings to you. Send for Catalog SPS-9, giving complete details.

Jaeger Bituminous Paver "Teams" with Jaeger Spreader.



America's most modern bituminous paver for high precision work—oscillating tiltable screeds, almost instant width adjustability to 12½', positive automatic leveling. Can pave flush to curb, gutter or previous lane. Confines all traction and heavy load to subgrade. Ask for Catalog BP-9.

THE JAEGER MACHINE CO., Columbus 16, Ohio

Leading distributors in 130 cities of the United States and Canada sell, rent and service the Jaeger equipment listed below.

PUMPS • MIXERS • HOISTS • TOWERS
CONCRETE and BITUMINOUS PAVING MACHINES

When writing, we will appreciate your mentioning PUBLIC WORKS

Salvaging Old Pavements by Resurfacing

Two types of resurfacing are being used in Iowa, rolled stone topped with asphaltic concrete, and portland cement concrete. The following details are from a paper by Vernon G. Gould before the Highway Research Board: For resurfacing with asphaltic concrete, the binder and surface are each $1\frac{1}{2}$ ins. in thickness. Where frost boils necessitate pavement replacement, 30 ins. of rolled stone plus $1\frac{1}{2}$ ins. of black base, plus binder and surface are used. When relocations necessitate replacement, 12 ins. of rolled stone are used with base, binder and surface as above. For integral widening with portland cement concrete, the widened section is 10 ins. deep and the depth over the existing pavement varies from 6 to 8 ins., depending on the condition of the old slab.

What Are Electric, Engine and Boiler Horsepowers?

W. F. Schaphorst

Confusion exists in the minds of many regarding the relationships between mechanical horsepower and the much greater horsepower of steam boilers. Surprising and inconsistent though it may seem, a boiler horsepower is 13.2 times as great as a mechanical or electrical horsepower. One boiler horsepower is 33,479 Btu per hour, while one mechanical or electrical horsepower is 2,544.6 Btu per hour.

The reason for this great difference goes back to the early days of the power age. When engines and boilers were first made, a boiler was rated by its ability to supply steam enough for a given engine. A

100-hp boiler was so rated because it could furnish steam enough for a 100-hp engine.

Boilers are more efficient now than they were in the days of James Watts; today a 100-hp boiler will furnish steam enough for a 250-hp engine. Engines also have improved, but not so greatly as the boilers, and that is why the old relationship no longer holds. In the old days, when one boiler horsepower produced one mechanical horsepower, the efficiency of conversion was only 7.6%; in other words, only 7.6% of the heat energy was converted into work. The best plants of today show much greater efficiencies.

Protecting A Sewer Outfall

The newest sewer outfall for Watsonville, Calif., is a 16-inch pipe which extends 1,400 feet out into Monterey Bay. This line was built up of $\frac{1}{2}$ -inch and $\frac{3}{8}$ -inch wrought iron plates. To overcome buoyancy and protect against abrasion by shifting sands, the pipe was wrapped with steel mesh, and given further protection, as follows: The outward 800 ft. were gunited; the next 600 ft. were coated with cement grout inside a steel casing. Similar protection was given to Watsonville's first line laid 25 years ago, which is still in good condition.

Golf Course Increases City Revenues

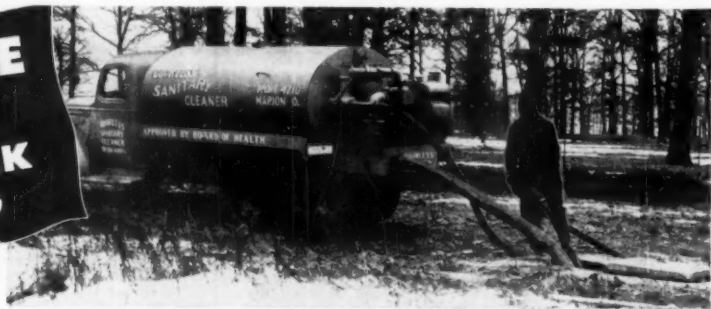
A nine-hole golf club at Ft. Morgan, Colo., has brought revenues of \$3,392 to the city in six months. Next year, income is anticipated at \$8,000, which should more than cover costs of operation and maintenance. The course has proved effective in attracting tourists to the city.

**COMPARE
O. S. C.
SEPTIC TANK
CLEANING**



**GORMAN-RUPP'S NEW "MIDGET"
1 1/2" PUMP**

FASTEST, self-priming, most efficient pump for general use. Weighs but 62 lbs. -- pumps 5500 GPH -- self-priming up to 30 ft. -- non-clogging, sturdy. Gorman-Rupp builds a complete line of pumps from the "HANDY", delivering 8 GPM, to large capacity pumps which deliver as high as 125,000 GPH.



WITH OLD FASHIONED, UNSANITARY METHODS

When a Sanitary Service Operator puts a new Gorman-Rupp Odorless Sanitary Cleaner on the job these are the results:—

1. A disagreeable job becomes pleasant, easy work.
2. Unsanitary methods and unhealthy conditions eliminated. Septic tank cleaning with an O. S. C. unit complies with or exceeds health regulations and requirements. It banishes open tanks, diaphragm hand pumps, shovels and other makeshift equipment.
3. It does each job more thoroughly, in

a fraction of the time previously required. For example, 500 gal. tanks are cleaned in 15 minutes, 1000 gal. tanks in 20 minutes.

4. It offers operators profit possibilities far in excess of income with present equipment and methods.
5. An O. S. C. unit has other profitable uses such as transporting water, emergency fire fighting, sprinkling, de-watering, etc.

Show this to Sanitary Service Operators in your community. For complete information write for Bulletin 7-ST-11.



THE GORMAN-RUPP COMPANY
MANSFIELD • OHIO

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

PUBLIC WORKS DIGESTS

WATER WORKS... 55 • HIGHWAYS AND AIRPORTS... 61 • SEWERAGE AND REFUSE... 67

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

THE WATER WORKS DIGEST

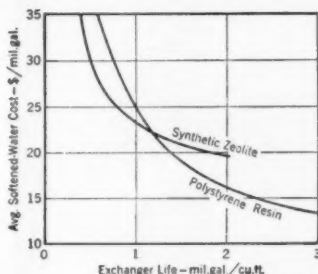
Financial Aspects Of Water Main Cleaning

In deciding whether to clean a given main, points to be considered are: 1. Will cleaning lower the station pumping head sufficiently to make it pay for itself in X months? 2. Will the distribution storage be sufficient to take care of the system over a period long enough to allow for contingencies during cleaning? 3. Can the transmission main be taken out of service at all? 4. Will the system gradient be raised sufficiently to warrant the expense? 5. How long will the benefits be apparent? As to the last, it is generally accepted that capacity deterioration occurs at different rates with different waters. Some of the author's mains had lost no capacity a year after cleaning, but this was not always the case.

R. J. Sweitzer—"Operating Aspects of Main Cleaning;" *Journal, Pennsylvania Water Works Operators Ass'n*, 1949.

Recharging Ground Water

In studying availability of ground water for a new supply, Canton, O., found two water-bearing strata separated by a 5-ft. layer of clay 50 ft. below the surface, the upper one fed by a creek and by precipitation, the latter a storage basin with limited inflow. The upper stratum, with no storage, gave insufficient supply during periods of no stream flow. The plan adopted was to sink two wells through the clay stratum so that the upper aquifer would feed the storage basin below, while a third well 140 ft. deep was used



Courtesy Journal AWWA

Life expectancy vs softening costs

to obtain the water supply by pumping. It is estimated that a certain supply of 10 mgd can be assured, together with 4 mgd flow in the creek, which is maintained because it passes through a park area lower down.

R. G. Kazmann—"Ground Water Storage and Recharge;" *PUBLIC WORKS*, February.

Removing Excess Fluoride

The U. S. Public Health Service and the city of Britton, S. D., are operating a plant for reducing to 1.5 ppm the 6.7 ppm of fluorides which is causing mottling of the teeth of almost all the children of the city. The plant is the first development of a study being carried on by the U. S. P. H. S. It has a capacity of 200 gpm. It consists of a pressure contact filter containing a bed of synthetic hydroxy apatite which adsorbs fluorides. This contact medium is regenerated by backwashing with dilute caustic soda, followed by rinsing, and passing car-

bonic acid solution through the medium to reduce the pH to about 7.7. The CO₂ gas is obtained from dry ice. Inflico and Pure Carbonic, Inc. participated in the development of the process.

"How to Take Fluoride Out of Water;" *Engineering News-Record*, Jan. 19.

Cation Exchangers

Recent development of high-capacity resinous exchangers has more than met the need for adequate capacity in ion exchangers, and economy of operation and life expectancy are the two most important factors to be considered in selecting base-exchange materials for municipal water softening. The Metropolitan Water Dist. of So. California, after 8 years of operation with Colorado River water, finds that siliceous zeolites lose material continuously and have a useful life of about 2 mg per cu. ft. of zeolite. The carbonaceous exchangers maintain their capacity quite well with continued use and the loss of material is not excessive if the upflow rate is kept low, but the fine particle size results in excessive loss of exchanger at normal upflow softening rates. The phenolic resins are oxidized by the chlorine in the softener influent water, causing disintegration of the surface of the particles and loss by carryover. The capacity of the softener unit as a whole may be appreciably reduced if measures are not taken to inhibit bacterial slimes which would cement the material and cause serious channeling.

The polystyrene resins maintain their normal characteristics under operating conditions which heretofore have caused the siliceous zeolites to lose capacity. From results to date, it appears that a minimum useful life of 3 mil. gal. per cubic foot may be expected from these materials. They are essentially unaffected by chlorine in the softener influent water. Finally, their ability to operate under salt semistarvation conditions without apparent deleterious effect on the resin or on the quality of the softened water makes the outlook very promising for the

use of these exchangers where economy of operation and a long useful life are factors of primary importance.

Lee Streicher and A. E. Bowers—"Cation Exchangers for Municipal Water Softening," *Journal, Am. Water Works Ass'n*, January.

Porous Plate Filter Underdrains

Porous plates especially adapted for filter underdrains have been developed since 1933 by the Carborundum Co., approaching in structure the finest grade of gravel or torpedo

sand and known as Aloxit grade 200. They have been used in some 200 installations. No gravel need be used, so there is no intermixing of sand and gravel, and thinner sand beds are practicable. There is uniform backwash discharge from the entire bottom. They are used in both gravity and pressure filters and lime and zeolite softeners. Standard size of plates is 11 $\frac{1}{2}$ " square. The $\frac{1}{4}$ " joints are made with phenol-free asphalts such as GK compound; or with "Lumnite" or portland cement, but these are not resilient and are not recommended. Several methods of supporting the plates to form a false bottom have been developed, among them one by Hardinge Co. and one by Walker Process Equipment, Inc. (the Camp design). To avoid clogging, water containing suspended solids should not be used for backwashing; water should not be filtered that has been inadequately coagulated or settled; or that, containing iron and manganese, has been aerated and not thoroughly settled; or highly unstable lime-softened effluent.

Frank C. Roe—"The Porous Plate Filter Underdrain System," *Journal Maine Water Utilities Ass'n*, January.

Machine Billing At Atlanta, Ga.

Atlanta has adopted the International Business Machine method for handling the 85,000 monthly accounts of its Water Dept. The equipment installed was two alphabetic key punches, an interpreter, two alphabetical accounting machines, a reproducing summary punch, a collator, a sorter, a Moore burster and a Moore imprinter. Skilled technicians schedule an even flow of billing throughout the entire month, materially reducing peaks and low work periods. The system automatically computes the bills, checks for errors and prints the customer's name and address, billing data, and message. It counts the customers, summarizes water use and revenue derived, copies meter reading sheets, and compiles a multiplicity of data with minimum manual effort. All accounts are balanced daily.

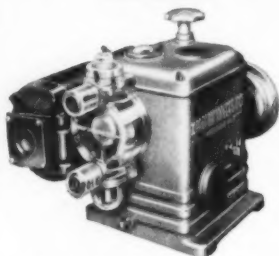
Paul Weir—"Machine Billing at Atlanta," *Journal Am. Water Works Ass'n*, January.

Bacteriological Quality Of Well Pump Lubricants

The Missouri Div. of Health investigated 134 wells in 95 cities to learn whether the lubricants, either water



Does YOUR Pumped Water Supply Need Treating?



%Proportioners% New Improved Heavy Duty Chem-O-Feeder. Positive displacement diaphragm type pump with feeding rate instantly adjustable while pump is operating. Has plastic "See-Thru" reagent head and many exclusive features. Capacity 0-8 gals. hr. against pressures 0-100 lbs. sq. in. Also available in duplex and triplex models.

Here's the simple water treating system that's worth looking into . . . whether you pump a few hundred or a million gallons per day. %Proportioners% Heavy Duty Chem-O-Feeder treats your water supply automatically, dependably. You can feed almost any water treating chemical—hypochlorite, polyphosphates, coagulants, pH control chemicals, or slurries. No more attention is required than filling the chemical reagent tank periodically — the Chem-O-Feeder runs in unison with the water pump and provides the exact chemical feeding you need.

Write today for Bulletin SAN-7 and get the whole story — you'll find %Proportioners% equipment fully meets your every requirement and saves you money.

% PROPORTIONERS, INC. %

% CODDING STREET, PROVIDENCE 1, R. I.

... "our experience
with raising
pressures has
been most
successful" ...

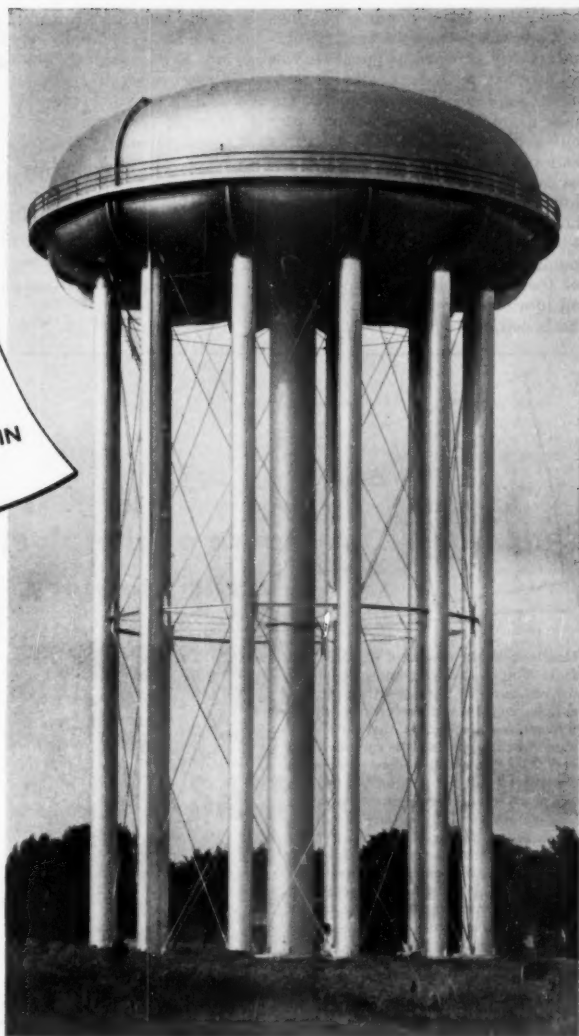
RALPH CAHILL
VILLAGE COMMISSIONER
WHITEFISH BAY, WISCONSIN

Horton elevated tank solves pressure problems of well-known suburb . . .

The commissioner's remarks are significant because they are concerned with a problem that could confront the officials of any community. The residents of Whitefish Bay, an attractive suburb north of Milwaukee, take pride in maintaining the appearance of their property—as do suburban residents all over America. They use a great deal of water in the summer for lawn sprinkling—which made it difficult to maintain uniform pressures in the village water mains.

To solve the problem, the 1,000,000-gal. Horton welded radial-cone bottom elevated tank, shown at the right, was erected. It was installed at a location farthest from the point where water pumped from the City of Milwaukee system enters the village. Because of its location, this Horton tank, supplying the mains by gravity pressure, produces ideal back-feeding—thereby raising the water pressure in former weak areas.

This is just one example of the way in which municipalities are utilizing Horton radial-cone bottom tanks. Built in capacities from 500,000 to 3,000,000-gals., these modern welded elevated storage tanks provide the answer to better water service for hundreds of similar installations. Learn what Horton tanks can mean to your city by writing our nearest office.



ENGINEERING DATA FOR WHITEFISH BAY . . .

Population Served—14,000
Area Served—2.1 square miles
Miles of Distribution Mains—17.2
Per Capita Consumption—105 gals. per day
Other Storage in System—None

HORTON

STEEL STORAGE TANKS
... for municipal service

CHICAGO BRIDGE & IRON COMPANY

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.

Atlanta 3.....	2123 Healey Bldg.	Los Angeles 17.....	1508 General Petroleum Bldg.
Birmingham 1.....	1532 North Fifth St.	New York 6.....	3316-165 Broadway Bldg.
Boston 10.....	1038-201 Devonshire St.	Philadelphia 3.....	1648-1700 Walnut St. Bldg.
Chicago 4.....	2115 McCormick Bldg.	Salt Lake City 4.....	539 West 17th South St.
Cleveland 15.....	2221 Guildhall Bldg.	San Francisco 11.....	1225-22 Battery St. Bldg.
Detroit 26.....	1536 Lafayette Bldg.	Seattle 1.....	1339 Henry Bldg.
Houston 2.....	2142 National Standard Bldg.	Tulsa 3.....	1641 Hunt Bldg.

When writing, we will appreciate your mentioning PUBLIC WORKS

or oil, used for well pump bearings had any effect upon the bacteriological quality of water supplies. It was found that 5 State health departments approved only water lubrication, 4 approved either oil or water but preferred the latter. Most states had no definite policy. Of the 134 wells studied, 38.8% had water lubricated pump bearings and 61.2% had oil lubrication. During 8 years, 4,861 samples of water from these pumps had been tested, and 1.85% of the 10 ml tubes of samples from oil lubricated wells were positive for *Esch. coli*, and 1.87% of water-lubri-

cated samples. Apparently lubricants have essentially no effect upon the bacteriological quality of the water supply.

L. E. Ordelheide—"Well Pump Bearing Lubricants and Bacteriological Quality;" *Journal Am. Water Works Ass'n.*, January.

Synthetic Detergents And Coagulation Of Raw Water

At Chicago's South Dist. Filtration Plant, study has been made of the effects of synthetic detergents on the coagulation of raw lake water. Three industrial and 3 domestic de-

tergents were used in several concentrations, but in general a concentration of 5.0 ppm was used which was the lowest that caused interference with coagulation. The coagulants used were alum, with and without lime; alum and silicate; ferric sulfate, with and without lime; and chlorinated coppers, with and without lime. The addition of lime produced a marked improvement in the coagulation, with all the coagulants. This may indicate that pH becomes a more important factor in coagulation when detergents are present. Also the lime may aid in the neutralization of the charge on the colloidal particles of the coagulant. The domestic detergents resulted in considerable more interference with coagulation than the industrial detergents. Without the addition of lime, alum-silicates gave better coagulation in the presence of detergents than did the other coagulants used.

John T. Cross—"Effects of Synthetic-Detergent Pollution;" *Journal Am. Water Works Ass'n.*, January.

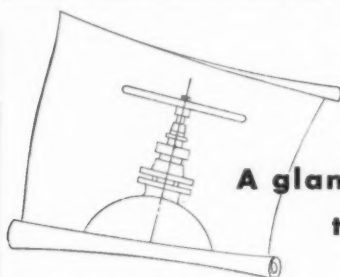
Determination Of Total Hardness

The total hardness method of Biedermann and Schwartzbach has been revised to improve the sharpness of the end point and to overcome the effect of minute quantities of copper and manganese in preventing an endpoint. With the revised buffer, indicator and titrating solutions, the effects of interfering ions have been determined. The direct colorimetric titration for total hardness is much more rapid than the soap method and less subject to errors of technique. It is extremely sensitive in the determination of low hardness values and an accuracy within 0.1 ppm is possible for 0.0-2.0 ppm hardness.

J. D. Betz and C. A. Noll—"Total Hardness Determination by Direct Colorimetric Titration;" *Journal, Am. Water Works Ass'n.*, January.

Electron Microscope In Water Treatment

By use of the electron microscope, objects may be enlarged 50,000-100,000 times; 500 to 5,000 by electronic magnification, which is multiplied by photographic enlargements. Laboratory workers prefer to use a magnification of 1500 for most work. Magnification of 20,000-30,000 diameters permits distinguishing the outside shape of bacteria. Study of coagulation is rendered difficult because the precipitate has to be dried



A glance at the blueprint tells the story

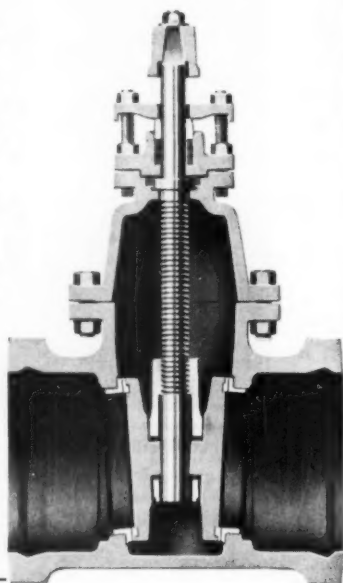
One look at the design of R. D. Wood Gate Valves and you know they will deliver superior service—they are so simple, rugged and foolproof. An important feature is that there are only three working parts—the spreader and two discs. No small wedges or delicate devices to fail in an emergency. No pockets to fill up with sediment or scale. The valves are fully bronze mounted, all surfaces making a tight seal. They close completely and open fully. In closing, the gates descend opposite the seats before the spreading action is applied. In opening, they move free of the seats before rising into the bonnet and permit unobstructed flow.

Made of thoroughly seasoned castings, rigidly inspected, and tested to 300 pounds hydrostatic pressure, R. D. Wood Gate Valves conform to A.W.W.A. specifications. They are a safety-plus factor for every modern community. Write for complete information today.

R. D. WOOD COMPANY

Public Ledger Building

Independence Square, Philadelphia 5, Pa.
Manufacturers of Mathews Hydrants and "Sand Spun" Pipe (centrifugally cast in sand molds)



R. D. Wood Company
Public Ledger Building, Phila. 5, Pa.

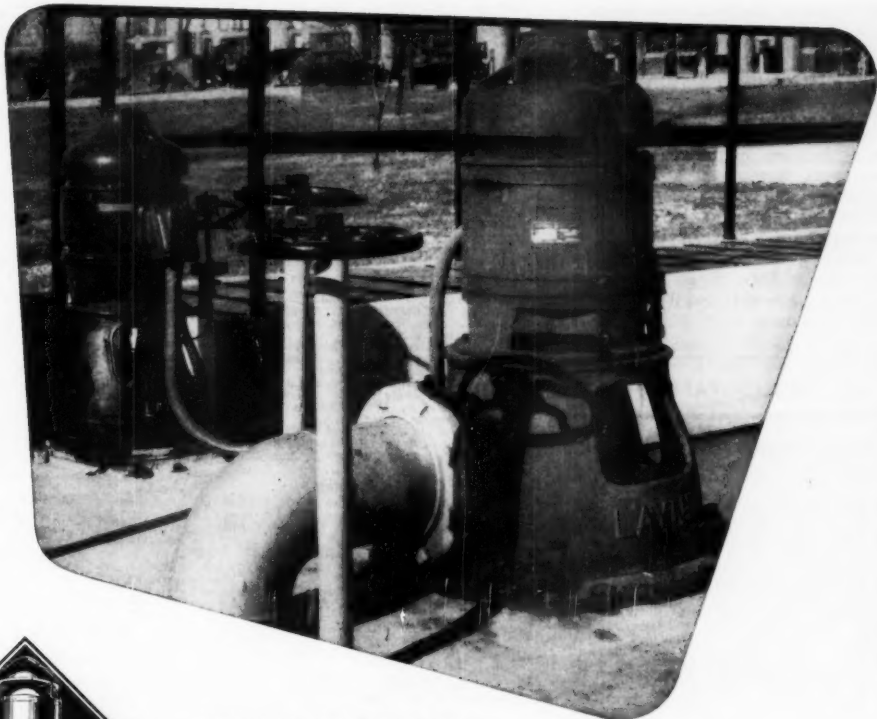
Please send me a Cast Iron Pipe Calculator absolutely free.



FREE!

Send for this Cast Iron Pipe Calculator. Determines, at a glance, class, weight and dimensions of bell and spigot pipe.

Name _____
Name of Firm _____
Street _____
City _____ Zone _____ State _____

**VERTICAL TURBINE PUMPS**

—are built in sizes from 40 to 16,000 gallons per minute. They may be installed in existing wells, saving the expense of a new drilling job. Other uses include fire protection, booster service, cooling tower, river pick up and a wide range of other uses. Send for the Layne Vertical Turbine Pump catalog.

WHAT'S TO BE SAID**ABOUT SATISFIED USERS**

The building of dependable water producing equipment involves a lot of extraordinary skill. And when it comes to skill Layne leans mighty heavily on seventy years of world-wide experience. It is from such experience that Layne has been able to find and strengthen weak points, use tougher and longer lasting materials and to constantly increase efficiency. As a result, users almost invariably stick to Layne equipment on each of their additional units.

It is a widely known fact that Layne Well Water Systems, point for point, always measure "head and shoulders" above any other make. This means that there is no advantage whatever in buying the so called "just as good" equipment. Furthermore there is no use telling you that this or that Layne part is super-duper. What you are buying—and have every right to expect, is

unquestionably good performance over a long period of years. That, in brief, is exactly what Layne offers without reservations of any nature.

If you now need, or expect to have need for more water at some future date, get in touch with Layne, or send for further information, catalogs, bulletins, etc., Address

LAYNE

LAYNE & BOWLER, INC.
GENERAL OFFICES, MEMPHIS 8, TENN.

BUILDERS OF HIGH EFFICIENCY

WELL WATER SYSTEMS

ASSOCIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-S.A. Mexico, D. F. ★ General Filter Company, Ames, Iowa.

Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ The Layne-Texas Co., Ltd., Houston, Tex. ★ Layne-Western Co., Kansas City, Mo. ★ Layne Minnesota Co., Minneapolis, Minn. ★ International Water Corp., Pittsburgh, Pa. ★ International Water Supply, Ltd., London, Ont. ★ Layne-Hispano American, S.A., Mexico, D. F. ★ General Filter Company, Ames, Iowa.

When writing, we will appreciate your mentioning PUBLIC WORKS

before being observed with the microscope, which may cause the structure to change considerably. However, at the Chicago filtration plant, use of the electron microscope for studying coagulation is being continued. In two years of use, operating troubles, both mechanical and electrical, have been greater than expected and have caused the machine to be out of service on several occasions for a week or more.

John R. Baylis—"Use of Electron Microscope in Water Treatment Control;" *Journal, Am. Water Works Ass'n*, January.

BIBLIOGRAPHY

American Water Works Ass'n Journal

Machine Billing at Atlanta. By Paul Weir, Mgr. Atlanta, Ga. Water Dept. January, Pp. 1-8.
Making Annual Reports Interesting. By E. B. Mayer, Engr. Dept. of Water & Power, Los Angeles. January, Pp. 9-13.
Well Pump Bearing Lubricants and Bacteriological Quality. By L. E. Ordelheide, Dir., Missouri Div. of Health. January, Pp. 14-16.
Effects of Synthetic-Detergent Pollution. Panel discussion by John F. Cross, Chemist, So. Dist. Filtration Plant, Chicago; Wm. U. Gallagher, Water Supt. Appleton, Wis.; Jos. G. Fluckey, W. Va. Pulp & Paper Co.; and John W. Hassler, W. Va. Pulp & Paper Co. January, Pp. 17-25.
Effects of State Highway Construction Policies on Utility Installations. Panel discussion by L. W. Grayson, Supt. of Pub. Utilities, Riverside, Calif.; Wm. G. Banks, Div. Engr.,

Newark, N. J.; Arthur C. King, Supt. W. W. Taunton, Mass. January, Pp. 26-32.
Advances in Chemical and Colorimetric Methods. By J. J. Connors, Bacteriologist-Chem., Oakland, Calif. January, Pp. 33-39.
The Versenate Titration for Total Hardness. By Harvey Diehl and Charles A. Goetz, Profs. of Chem., Iowa State College, and Clifford C. Hach, Pres. Hach Chemical Co., Ames, Ia. January, Pp. 40-48.
Total-Hardness Determination by Direct Colorimetric Titration. By J. D. Betz and C. A. Noll, Mgr. and Chem. Engr., W. H. & L. D. Betz. January, Pp. 49-56.
Possibilities of Newer Bacteriological Techniques. By Harry G. Neumann, Microbiologist, Dept. of Water & Power, Los Angeles. January, Pp. 57-65.
Use of Electron Microscope in Water Treatment Control. By John R. Baylis, Engr. of Water Purif., Chicago. January, Pp. 66-74.
High-Capacity Cation Exchangers. By F. K. Lindsay, Nat'l. Aluminate Corp., January, Pp. 75-80.
Cation Exchangers for Municipal Water Softening. By Lee Streicher and A. E. Bowers, Chemists, Met. Water Dist. of So. Calif. January, Pp. 81-92.
The Value of Standards to the Water Works Industry. By Harry E. Jordan, Secy. A.W.W.A. January, Pp. 93-97.
What the State Health Department Expects from Licensed Water Works Operators. By John M. Hepler, Dir. Michigan Dept. of Health. January, Pp. 98-102.
The State Bd. of Health and Public Water Supplies. By Arthur N. Beck, Chf. San. Engr., Alabama Health Dept. January, Pp. 103-106.

Civil Engineering

Delaware Aqueduct Metering and Control Equipment Incorporates Many New Features. By Walter J. Grez, Engr. Bd. of Water Supply, N. Y. January, Pp. 37-41.

Engineering News-Record

How to Take Fluoride Out of Water. Jan. 19, Pp. 40-41.
Delaware Seen as Best Answer to Four-State Water Demand. By Arthur J. Fox, Jr. Feb. 2, Pp. 25-26, 30.
Let's Sell Water. Discussion by W. H. DeBerard, Melvin P. Hatcher, E. J. Taylor, Louis E. Ayers, and W. J. O'Connell, Jr. Feb. 9, Pp. 40-43.

La Technique de l'Eau

L'Utilisation de la Filtration Mecanique Pour

PUBLIC WORKS for March, 1950

Ameliorer l'Effluent des Stations d'Epuraton d'Eau Residuaire. By M. A. Gobeaux. January, Pp. 11-13.
Considerations Physico-Chimiques sur les Reactions d'Epuraton par Precipitation. By M. Robert Stumper. January, Pp. 15-19.
La Sterilisation de L'Eau per l'Hypochlorite de Soude Produit par Electrollyse. January, Pp. 27-29.

Maine Water Utilities Ass'n Journal

The Porous Plate Filter Underdrain System. By Frank C. Roe, The Carborundum Co. January, Pp. 22-32.
Experiences in Laying Pipe Under Water. By Carl Crane, Engr. January, Pp. 33-36.

Midwest Engineer

The Ground Water Conditions in the Chicago Area. By A. M. Burwell, Max Suter and H. E. Hudson, Jr., Illinois State Water Survey. February, Pp. 6-9.
The Critical Situation in the Outlying Sections. By Arthur W. Consoer, Cons. Engr. February, Pp. 9-10, 20.
A Proposed System for the Area. By Loran D. Gayton, Asst. City Engr. February, Pp. 11-14.

Pennsylvania Water Works Operators Ass'n Journal

Operation of the Water Supply System and Other Utilities of the Pennsylvania State College. By R. J. Sigworth, Supt. of Utilities, Year of 1949, Pp. 75-81.
The Use of Leak Detectors and Pipe Locators. By V. B. Corle, Mgr. Westmoreland Water Co. Yr. of 1949, Pp. 82-88.
How the Rocks of Pennsylvania Were Formed and Their Influence on the Quality of the Public Water Supply. By Jack B. Graham, U. S. Geological Survey. Yr. of 1949, Pp. 89-104.
Symposium on Cleaning and Lining Water Mains. By R. F. Goodhue, J. A. Frank, A. B. Anderson, R. J. Sweetser. Yr. of 1949, Pp. 112-123.

Public Works

Problems of Small Surface Water Supplies. By W. W. Towne, San. Engr., U. S. Pub. Health Service. February, Pp. 35-37.
Ground Water Storage and Recharge. By R. G. Kazman. February, Pp. 45-46.

Water Works Engineering

How Jerusalem Was Supplied During Siege by the Arabs. By Ernest Stock. January, Pp. 30-32.
How New Yorkers Have Been Made Water-Saving Conscious. January, Pp. 35-37, 70.



After the first issue, you'll look forward to these regular, rib-tickling features:

- AMERICAN PHILOSOPHY
- ALIBIS I'VE MET
- LETTERS THAT PASS IN THE NIGHT
- DIZZY DEFINITIONS
- CARTOONS



Your copy of
PIPE DREAMS
is waiting!

NO CHARGE

NO OBLIGATION

Pipe Dreams is a pocket-size magazine of American philosophy and good cheer. Published bi-monthly by The Universal Concrete Pipe Co., it's yours for the asking. Send us your address today; a postcard will do the trick.

**Universal
CONCRETE PIPE COMPANY**
297 South High Street Columbus 15, Ohio

When writing, we will appreciate your mentioning PUBLIC WORKS

THE HIGHWAY and Airport Digest

PUBLIC WORKS DIGESTS

Inlets For Highway Drainage

Research was conducted by the University of Minnesota to obtain data on capacity of grate inlets for street and highway drainage, which resulted in the development of new designs, smaller in size but with higher capacity. Capacity is greatly increased by permitting a small amount of flow carryover—0.1 to 0.2 cfs carryover doubled the inlet capacity. The carryover is partly or wholly composed of flow around the inlet, which should be at least 24" wide in most cases; this width will intercept 85% or more of the flow for a width of flow up to 4.0 ft. The efficiency of a grate inlet depends mainly on the effective length of individual openings measured in the direction of flow. With transverse bars, rounding the down-stream edge greatly increased the capacity. Longitudinal bars were much more effective than transverse in passing leaves, paper, etc. Three different designs were developed; one best for low slopes and moderate carry-over; another for high slopes; a third, nearly equal to the others under all conditions.

"How to Design Better Inlets for Highway Drainage," PUBLIC WORKS, February.

Highway Shop For La Crosse Co., Wis.

In November 1949 the Highway Dept. of La Crosse Co. moved into a new shop located about a mile from the geographic center of the county. The general plan and dimensions are shown by the accompanying illustration. The roof over the storage area slopes from a height of 24 ft. at the center to 12 ft. at the sides. The only windows are in the offices of the commissioner and shop superintendent, the remainder of the building having large panels of glass blocks so formed as to throw light deep into the middle of the building; they also reduce the heat loss and cost of maintenance. The floors throughout the storage and work areas are of 8" reinforced concrete with an extra-heavy application of floor hardener. The lighting is fluorescent. Dilution with outside air to

remove carbon monoxide gases and heat are provided by three projection-type unit heaters, which are draw-through units of vertical-discharge, propeller-fan type, low-pressure steam for which is generated by a large oil-fired boiler. The total cost was \$305,250, which included building and equipment, septic tank, architect's fee, soil tests and all other items.

Paul A. Hartwig—"Wisconsin County Builds New Shop," *Better Roads*, January.

Rubber In Bituminous Roads

It is claimed for rubberized bituminous surfaces that the rubber gives better stability, moisture sealing, and anti-skid properties; reduces maintenance expense; and the surface does not become dusty with use. Test sections have been laid in Virginia, Ohio, Minnesota and New York City.

Bernard E. Gray, general manager of the Asphalt Institute, believes that "it will take considerable time to obtain any accurate measure of the value resulting from the use of rubber. Rubber is, of course, many times more expensive than asphalt, and it would probably be cheaper to place a light resurfacing every 10 years than to employ rubber, if durability were the only factor.

"However, rubber does make for a tougher mix, and our experiments indicate that a rubber-asphalt ce-

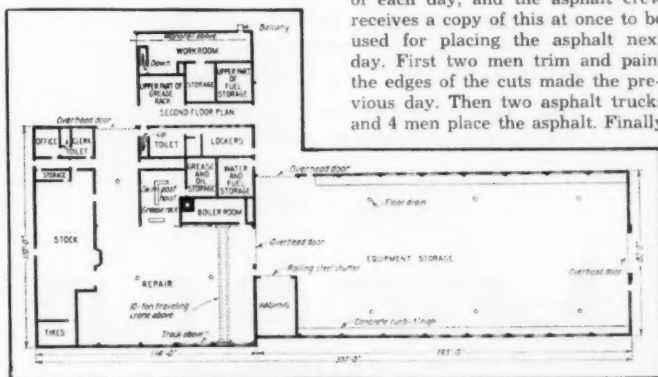
ment will produce a mixture having higher stabilities than when asphalt alone is employed. The addition of rubber also tends to produce a dry surface, but whether this is accompanied by a greater tendency to cracking, so far I do not know."

Merle E. Dowd—"Rubber Tested in Bituminous Roads," *Better Roads*, January.

High-Speed Street Patching

A firm contracting for patching pavements in the District of Columbia, McGuire & Rolfe, Inc., has so systematized the work that it has made repairs at 35 different locations in one 8-hr. day. Five crews are used. A breaker crew of 4 men, with a truck-mounted air compressor and 4 jack-hammers breaks the pavement into pieces about 18" x 24", sets up barricades and moves on to the next job. Then a rough-grade crew of 6 men, using a hydro-crane and two 5-yd. trucks, excavates the broken material with a 1/4 yd. clamshell. Then a 2-man fine-grade crew, using shovel, broom and tamper, prepare the ground to receive the concrete. Next concrete is deposited by a 5-yd. transit mixer, to within 2" or 3" of the pavement surface. Finally, just before 4 o'clock, a light-up crew hangs lanterns at all the jobs and places burlap for curing cover.

The location and sizes of all the cuts made are reported at the end of each day, and the asphalt crew receives a copy of this at once to be used for placing the asphalt next day. First two men trim and paint the edges of the cuts made the previous day. Then two asphalt trucks and 4 men place the asphalt. Finally



La Crosse County's highway shop layout

Courtesy Better Roads

a roller is brought on a truck-drawn trailer, the patch is rolled, and the barriers, lanterns and any other materials are loaded into the truck.

Martin B. Jaeger—"High-Speed Street Patching Methods;" *Roads and Streets*, January.

Axle Loads On Highways

In 1936-1937, gross loads of 40,000 lb. or more amounted to only about 1% of the total number of commercial vehicles on the highways. By 1942 this frequency had tripled, and by 1948 had again doubled. Fre-

quency of heavy axle loads shows a similar rise. But, since the number of trucks has also increased greatly, the total number of heavy axle loads found on the highways in 1948 was eighteen times the number in the 1936-37 period, and the rate of increase appears to be accelerating rapidly.

A study of heavy load frequencies by regions indicates that the most favorable situation exists in the Western regions, where legal limitation of 50 feet or more in length permits advantageous distribution of heavy loads on vehicle combinations

with five or more axles. In the remainder of the country, where the length is limited to 45 feet in most States, vehicles with more than four axles are little used, and three- and four-axle combinations carry the bulk of the highway tonnage. It is these two types that have the highest frequency of heavy axle loads.

Legal limitation of axle loads, with effective enforcement, seems to be the only way our pavements can be protected. Somewhat less-stringent length limits would encourage wider use of vehicle combinations that spread the load over a sufficient number of axles, thus permitting reasonable increases in pay loads.

John T. Lynch and T. B. Dimmick—"Axle-Load and Gross-Load Trends;" *Public Roads*, February.

↓
LOOK ... THIS EAGLE LOADER HANDLES
5 YARDS PER MINUTE ... EASILY
↓ ↓ ↓



For handling any loose material — coal, cinders, slag, dirt, snow, etc., here is your economy answer:

One man operated — moves quickly from job to job at highway speeds.

Write for complete specifications:
Dep't—PW-3

EAGLE
JAW CRUSHERS • IMPACT BREAKERS
PULVERIZERS • CONVEYORS • LOADERS
CRUSHER CO., Inc. GALION OHIO U.S.A.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

Multiple-Pipe Culverts

In southern New Mexico, where flash floods have to be carried under highways with very little head room, multiple-pipe culverts are in common use, this being estimated to be more economical than concrete boxes for these locations. The pipe used is 30" concrete in 4 ft. lengths, the lines being placed on 5-ft. centers. Sixteen culverts have been placed with 10 to 43 lines in each, but a record was reached with 183 lines, containing nearly 3,000 pipes, in one culvert. Before placing the pipes, the site was blanketed with 12" depth of sand. Stakes were driven on each side of each line of pipe giving the exact elevation of the pipe inverts; and these stakes supported two parallel iron pipe runners, along which a template was drawn to trench the sand to form a bed for the pipe 6" deep. Backfill was placed and hand-tamped in 12" layers.

Lindsay F. Root—"Super-Multi Pipe Culverts Placed by Assembly Line Methods;" *Roads and Streets*, December.

Curing With Bituminous Materials

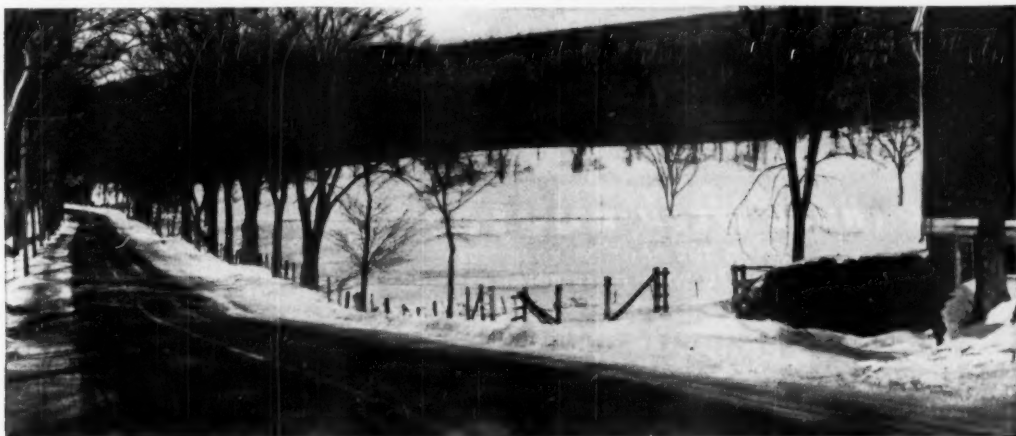
The Soil-Cement Committee of the Highway Research Board, with the cooperation of the state highway departments of Illinois, Kansas and Nebraska and the city of Little Rock, Ark. has studied the effectiveness of bituminous materials in retaining moisture in soil-cement for seven days following construction. Moisture determinations were made in the top 3/4" of the pavement, and in the 3/4" immediately below this. Among conclusions reached were:

STANDS UP UNDER SUN OR FROST!



Under summer sun, roads built with Tarvia* road tar are non-glare and blend with every landscape. Moreover, they are self-healing under compacting traffic, and they will not wave, roll,

push, or bleed. In addition, Tarvia* road tar roads are always easy on the eyes, and always easy to ride on.



When frost and snow comes, roads built with Tarvia road tar are easier to keep open. That's because their black surface absorbs heat—causing snow and ice to melt more readily. In

addition, Tarvia road tar is not affected by either calcium chloride or sodium chloride.

Barrett's 46 years of experience in road building, maintenance and repair is yours for the asking. Ask the Barrett field man.

THE BARRETT DIVISION

ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

New York • Chicago • Birmingham • Detroit
Philadelphia • Boston • Rochester • Columbus
Youngstown • Ironton, O. • Syracuse • Buffalo
Bethlehem, Pa. • Portland, Me. • Bangor,
Me. • Norwood, N. Y. • Oneonta, N. Y. • Elmira,
N. Y. • Cromwell, Conn. • Norwich, Conn.
In Canada: THE BARRETT CO., LTD., Montreal
Toronto • Winnipeg • Vancouver



Thanks to their slightly granular, "tractionized" surface, roads built with Tarvia road tar give tires a firm tread hold.

Barrett
Tarvia*
ROAD TAR

*Reg. U. S. Pat. Off.

When writing, we will appreciate your mentioning PUBLIC WORKS

Asphaltic materials were very efficient. They should be applied the same day as construction—as soon as possible after surface finishing has been completed. The finished surface should be tightly knit and even, and contain sufficient moisture to prevent penetration of the bituminous material; under which conditions the bituminous material adhered firmly to the soil-cement. Penetration of the soil-cement by the bituminous material materially reduced the adherence and also lowered the hardness and quality of the soil-cement. With soils generally used, 0.15 to 0.20 gal. per sq. yd. of bituminous curing material will produce a suitable film, but more may be required to fill low spots or on coarse, open-texture soils. If traffic must use the road while the bituminous material is sticky, about 10 lb. per sq. yd. of stone chips or sand may be spread. This bituminous material may serve as the prime and tack coat for a final bituminous surface, if properly placed; and any suitable type of bituminous surface may be laid on it.

"The Use of Bituminous Materials for Curing Soil-Cement Surfaces;" **PUBLIC WORKS**, February.

BIBLIOGRAPHY

Asphalt Institute Quarterly

American Cities Prefer Asphalt. January, Pp. 4-5.

Construction Methods. Pp. 6-7.

Resurfacing Problems. Pp. 8-9.

Street Maintenance. Pp. 10-11.

Better Roads

Wisconsin County Builds New Shop. By Paul A. Hartung. Co. H'way Comr. January, Pp. 19-20, 35.

How Many Signs on County Roads. Panel Discussion. January, Pp. 24-25, 36.

Requests for More and Better Signs Are Often Unreasonable. By Paul B. Rynning, Co. Engr., Jackson Co., Ore. January, Pp. 25-26.

Rubber Tested in Bituminous Roads. By Merle E. Doord. January, Pp. 31-33.

Modern Bridges for County Road Systems. By J. R. Cooper, Bridge Engr., Indiana St. H'way Com'n. January, Pp. 33-35.

Civil Engineering

Wet Silt Under Base Course Damages Alaska's Glenn Highway. By Martin Ekse, Asst. Prof. of C. E., Univ. of Washington. January, Pp. 42-43.

California Builds Wider, Safe Highway on Ridge Route. By Spencer F. Cortelyou, Asst. State H'way Engr. January, Pp. 44-46, 90.

Experimental Pneumatic Roller Promises Reduced Compaction Costs. By J. G. Patrick and R. J. Pope, Soil Engineers, U. S. Corps. of Eng. January, Pp. 52.

Contractors Record (England)

Road Alignment. By Richard A. Abbott. Jan. 11, Pp. 19-23; Jan. 18, Pp. 11-19.

Engineering News-Record

High-Center Traffic Barrier Installed on Steep Hill. Feb. 2, P. 36.

Public Roads

Axle-Load and Gross-Load Trends. By John F. Lynch, Chf., Planning Surveys, and T. B. Dimmick, Head, Current Data Analysis, Bureau Pub. Rds. February, Pp. 279-286.

Traffic Trends on Rural Roads in 1948. By Thomas B. Dimmick, Head, Current Data Analysis. February, Pp. 287-295, 298.

PUBLIC WORKS for March, 1950

Public Works

How a One-Way Grid System Solved Traffic Problems. By R. P. Karolovitz. February, Pp. 38-39.

How to Relate Traffic Volumes to Peak Flows. By O. K. Norman and W. P. Walker. Highway Research Board, February, Pp. 42-44.

How to Design Better Inlets for Highway Drainage. February, Pp. 48-49.

Bituminous Resurfacing by Machine. By Sanford F. Giles, Comr. of Public Works, Oak Park, Ill. February, P. 59.

The Use of Bituminous Materials for Curing Soil-Cement Surfaces. February, Pp. 62-63.

Roads and Construction

Concrete Paving Methods on Manitoba's Main Tourist Highway. January, Pp. 56-57, 90.

Low-Cost Asphaltic Roads. By Bernard E. Gray, Pres. Asphalt Institute, January, Pp. 60-63, 76.

An Analysis of Roadway Capacities. By O. K. Norman and W. P. Walker, U. S. Bureau of Public Roads. January, Pp. 64-68, 78.

Roads and Road Construction (England)

Soil Cement Stabilization. By W. P. Andrews. January, Pp. 4-7.

Roads and Streets

High-Speed Street Patching Methods. By Martin B. Jaeger. January, Pp. 41-44.

Proper Sizing of Excavator vs. Hauling Equipment. January, Pp. 47-51.

Uphill Truck Speeds Surveyed by Arizona Highway Engineers. By H. M. E. Wiley, Engr. Arizona H'way Dept. January, Pp. 52-54, 63.

Selection of Rock Drilling Equipment for Road Construction. January, Pp. 56-57.

Pit Gravel Hot-Mix for Economical County Road Construction. By Frank A. Evans, Engr., Ingham Co., Mich., Road Com'n. January, Pp. 73-78.

A Few Fundamentals of Low-Cost Road Design. January, Pp. 78-82.

Garaging and Off-Street Parking Requirements

Under a proposed rezoning ordinance of Rochester, N. Y., automobile and off the street parking requirements are, in general, as follows: For residences, there must be provided on the same lot at least one automobile parking space for each living unit contained in the house or apartment. In addition, off-street parking facilities must be provided for guests and business purposes. Off-street parking areas or garages must be provided for other than residential uses, as follows:

For each church, one parking space for each ten seats in the main worship auditorium; for each public building, museum or art gallery, one parking space for each 250 sq. ft. of floor space open to the public; for each building used as an office for a civic, religious or charitable organization, parking spaces to accommodate the persons working or having business therein, and at least one parking space for each 300 sq. ft. of floor area, excluding cellars and unfinished attics.

The parking spaces to be provided may be open air parking areas, attached or detached garages, or combinations of both. There are required at least 160 sq. ft. exclusive of access drives, for each parking space; and there are a number of restrictions on the location of the parking spaces.

GET THOSE WEED ROOTS!

GO TO THE ROOT OF YOUR WEED PROBLEM WITH THESE DOLGE PRODUCTS



KILL WEEDS HERE!

DOLGE SS WEED-KILLER

Where no vegetation whatever is desired. Penetrates deep down to plant roots and kills. Sterilizes the soil, preventing normal sprouting of wind-blown seeds. Weeding the thorough, modern chemical way eliminates backbreaking toil and saves the cost of many labor-hours.

E.W.T. SELECTIVE WEED-KILLER 2-4-D

Highly recommended for maintaining beauty of lawn and fairway. Works its way down into the roots of brush, dandelion, plantain, poison ivy, ragweed, sumac and other obnoxious plants, but does not injure most turf grasses.

Please write for descriptive literature explaining how these tested DOLGE products can best be used for your weeding requirements.

The C. B. DOLGE Co.
WESTPORT, CONNECTICUT

MAPPING CONSTRUCTION MATERIALS

Frank E. Byrne,
Geologist, U. S. Geological Survey

This is an abstract of a paper by Mr. Byrne before the Highway Research Board, and is adapted from Highway Research Abstracts.

BASIC materials that the engineer needs for construction are the rocks and sediments of the earth's crust. The geologist, because of his knowledge in this field, is best qualified to prepare the maps the engineer needs in his search for construction materials. Construction programs require great quantities of these basic materials, and utilization of geological skills may result in marked savings in the cost of engineering construction.

Three principal kinds of construction-material maps are discussed: Material-site, material-distribution; and surface geology.

Material-Site Maps

A material site map is usually made on a small scale, about 1 inch to 15 miles. The work is done in the office, although some of it is checked in the field, and is based upon the materials records available to the compiler.

The material-site map is the least expensive of the three kinds to prepare. It is an excellent inventory of materials that have already been found and tested, but it includes only those known to the compiler by reason of the basic data with which he has been supplied. It does not show other construction materials that may be present in the same area but have not previously been needed and tested. It is not a good basis for the search for additional materials.

Material-Distribution Maps

The material-distribution map also is prepared in the office, usually to the scale of 1 inch equals 15 miles. The map is based on the geologic maps available for a region. Each outcropping formation shown on a geologic map is classified as to the kind of construction material that can be produced from it.

The cost of preparation of a material-distribution map is moderate. The map is an excellent inventory of all kinds of material available in a region, and it shows the potential production areas for each material. It is a useful base for the search for construction materials.

Adequate geologic maps, however, are available for only limited areas

in the United States. Further, the correlation of test data with the materials shown on the map is inexact.

Surface-Geology Maps

The surface-geology map combines most of the useful features of the other two kinds of maps. It is constructed to a relatively large scale; it shows the outcrop areas of all geologic formations and the locations of existing pits and quarries in the area.

A field party maps the geologic formations, both consolidated rocks and unconsolidated sediments, usu-

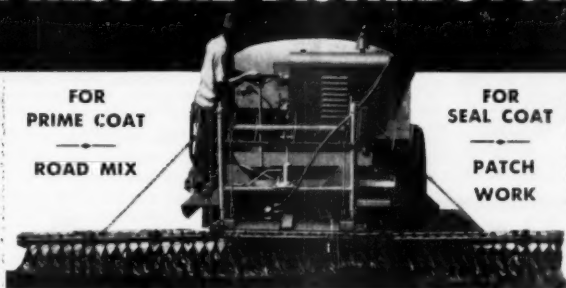
ally on aerial photographs. The field party also plots the locations of all existing pits and quarries, locates additional materials, and collects samples for laboratory testing.

This kind of map is unexcelled as a guide for materials exploration. It shows the available production sites, the existing pits and quarries, and the areas that should be explored in the search for additional materials. And, because the correlation of test data with geology is reasonably exact, it guides the engineer to these areas where the most desirable sources of materials outcrop.

STANDARD STEEL PRESSURE DISTRIBUTOR

FOR
PRIME COAT
ROAD MIX

FOR
SEAL COAT
PATCH
WORK



**FULL CIRCULATING SPRAY BAR
GIVES UNIFORM SPREAD OF MATERIAL
THROUGHOUT LENGTH OF BAR...**

**SIMPLIFIED PIPING PERMITS
FAST LOADING AND LAYING...**

✓ 25% More Asphalt shot per day! Faster loading! No delays Starting! Instant cleaning at end of run! These are facts known to every operator of **Standard Steel Pressure Distributors!** Why? Because of the simplified piping in this equipment! The full circulating spray bar contains submerged valves which are quickly heated and remain uniformly hot at each point of pouring. The throw of a single lever opens and closes all valves instantly. Every inch of the spray bar delivers precisely the same material output—lightest or heaviest bituminous material. And there are 12 other special features that make this equipment outstanding in performance. Write for catalog 424 today for complete details.

OTHER PRODUCTS

Maintenance Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.



P.D.3

Standard Steel Works, NORTH KANSAS CITY, MO.

When writing, we will appreciate your mentioning PUBLIC WORKS

The surface-geology map is the most expensive of the three to prepare. The expense, however, is a self-liquidating one and the money expended is returned many times over. The map itself serves indefinitely as a completely adequate base for the efficient search for materials, and is also a valuable source of information for the planning engineer, for the design engineer, and for the engineer estimating the cost of construction.

HOLE DIGGING

made easy!

Diggers only of complete units for sale, for rent, for hire. We contract to dig holes 2" to 24" diameter 4' to 18' deep. We travel any place, including Canada, Mexico, and South America. We also dynamite drainage ditches and straighten streams to conserve soil. Reasonable rates. Truck and tractor units ready to go. For fast action, write, wire, call. Atom Mfg. Company, Moline, Illinois.

ATOM POWERFUL HYDRAULIC



HOLE DIGGERS

2" to 24" augers
4' to 18' depth.
Fast becoming a
standard implement
with good dealers.

ATOM MFG. CO.
Moline, Illinois

\$5.22 a ton for Asphalt is worth saving!

The Foote Kinetic Asphalt Mixer will give you 8 to 10 more batches from a barrel of asphalt. One user* has reported savings of \$5.22 a ton. They used to buy their material for \$10.50 a ton. Now they make it with the Foote Kinetic Asphalt Mixer for \$5.28 a ton. \$5.22 a ton is worth saving! Such savings will soon pay for your Foote Kinetic Mixer.

You cannot compare the Foote Mixer with an ordinary concrete mixer either from the standpoint of construction or the finished product. Let us send you complete details. Ask for Bulletin K-100.

*Name on request.

- 3 cu. ft. in 30 seconds
- High output for low investment
- Handles any mix
- Fully portable
- New mixing principle gives you 8 to 10 more batches out of every barrel of asphalt

THE FOOTE CO., INC.

Subsidiary of Blaw-Knox Co.

1954 State St., Nunda, New York



the FOOTE
Kinetic
mixer

A BLAW-KNOX PRODUCT

A
DEPENDABLE
JOINTING
COMPOUND



FOR BELL
AND SPIGOT
WATER MAINS

HYDRO-TITE

HYDRAULIC DEVELOPMENT CORP.

MAIN SALES OFFICE • General offices and works
50 CHURCH ST. N.Y.C. • W. Medford Sta. Boston, Mass.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

Municipal Power Plant Makes Profit

The most recent addition to the Okeene, Okla., municipal power plant, which has grown in size from an annual generation of 640,760 kw in 1938 to 2,850,550 kw. in 1948, is a Nordberg dual-fuel engine. Using natural gas as a fuel, this engine saves over \$1,000 per month in fuel as compared to previous oil-burning power units. This saving in operating cost will quickly pay for the new engine. This engine, like the older units, was purchased without a bond issue. All of the engines installed have been paid for from plant receipts.

The new gas-burning engine is a four-cycle, six-cylinder supercharged dual-fuel unit of 13-in. bore and 16½-in. stroke, rated at 840 hp at 450 rpm. Its 590 kw output practically doubles the capacity of the plant. The three other engine generators have a combined output of 704 kw. The new engine is able to carry the normal plant load and, due to its lower operating cost, is used alone until the load falls, usually after midnight, when one of the small engines can carry it.

The plant has been kept up to date. Within the past ten years, the

PUBLIC WORKS for March, 1950

switchboard at the plant has been enlarged and modernized and other improvements made. The city has bought a new fire truck, street sweeper, tractor, and pick-up truck; has installed a booster pump in its water line; has enlarged its distribution system; and has installed street paving costing \$85,855. All of these were paid for from power plant revenues. In addition, the city contributes from power plant income over \$7,000 per year for the operation of such city services as police and fire departments, trash hauling and street and alley maintenance.

S. O. Isbill is superintendent of the Okeene power plant; Frank Pietz is village clerk; O. L. Goforth is mayor and Melvin Geis and Edward Mehew are trustees.

Testing Highway Axle Weight Effects

Traffic will be diverted from 1.1 miles of 2-lane concrete highway in Maryland in order to permit a study of the effect of heavy truck usage on highways. The experimental section, built about nine years ago, is of reinforced concrete, 9 ins. thick at the edges and 7 ins. at the center, with 12 to 18 ins. of base material, and mesh reinforcing. The section will be divided into two sections, making four strips available for testing, and each strip will be subjected to axle weights of only one type. These will include: 2-axle truck with 18,000 lbs. rear axle weight; 2-axle with 22,000 pounds; tandem with 16,000 lbs. on each axle, total 32,000 lbs.; and tandem with 22,400 on each axle. Each truck will pass over its test lane about 500 times a day for 3 to 6 months. Before the project starts (soon after April 1 to insure that frost is out of the ground) a complete chart and photographic survey will be made of all cracks in the pavement, and as new cracks start, they will be charted.

New Process for Treating Beet Sugar Wastes

A new process of waste treatment for sugar beet manufacture has been announced by Dr. Clair N. Sawyer, associate professor of sanitary chemistry at Massachusetts Institute of Technology. It is said that this process, which involves addition of chlorine to the wastes, reduces the amount of water required for operation by about 30%, permits reuse of water and increases sugar yield about 4 pounds from every ton of beets.

THE SEWERAGE and Refuse Digest

PUBLIC WORKS
DIGESTS

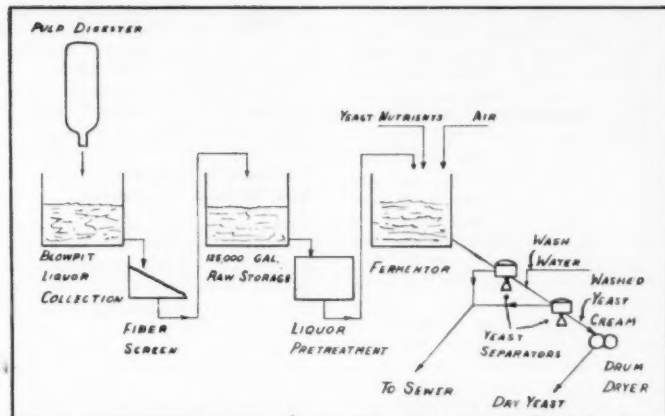
Disposal Of Garbage With Sewage

It has been estimated that, if the garbage of a community should be disposed of by adding it to the sewage, the quantity of primary sludge would be increased from 55% to 300%, and the B.O.D. and suspended solids load on the secondary process 10% to 20%. Digestion capacity must be increased, some say 3 cu. ft. to 7 cu. ft. per capita over the capacity required for normal sewage. The sewage sludge gas will probably be 100% to 150% greater than without garbage. This high rate suggests stage digestion and making the primary digester shallow with large surface area. The supernatant should be drawn from the second-stage digester only, as the B.O.D. is only about half of that from the primary. If there is only primary digestion it might be well to settle the supernatant in a sludge thickener. If the sludge is to be used for fertilizer, there will be more at practically no additional cost. If it is to be filtered, less chemical will be required for conditioning and the fuel value for incineration will be greater.

Kenneth W. Cosens — "Design Factors in Dual Disposal," *Sewage and Industrial Wastes Engineering*, January.

Controlling Insects At Dumps

Dumps are normally inhabited by crickets, flies, cockroaches and mosquitoes. Though few crickets and cockroaches may be seen on the surface, there may be millions down in, where they remain normally but may emerge and cause a nuisance. Mosquitoes on dumps are limited to the house mosquito. Several kinds of flies breed in dumps and the methods employed differ slightly with the different kinds. Neither wrapping garbage nor burning is effective for control, but few insecticides are. For blow-flies, treatment of the active face of the dump twice a week with 5% DDT emulsion will generally be satisfactory. A 5% DDT and other dusts are used to a less extent; they are easier to apply, require less expensive equipment, and



Flow sheet for yeast production from sulfite liquor.

will sift through the refuse better than sprays. The same methods, being sure to cover water and water-holding debris, will effect mosquito control. For control of crickets and roaches, a 2% chlordane emulsion or dust applied at monthly intervals gives excellent results.

Elton J. Hansens — "How to Control Insects in Refuse Dumps;" *PUBLIC WORKS*, February.

Yeast Production From Sulfite Waste Liquor

Development of practical methods of treating SWL has been deterred by the great dilution of the organic matter, the corrosive properties of the sulfurous and acetic acid content, and the ash and scale-forming properties. Among the methods tried are activated sludge, trickling filters, contact aeration, anaerobic methane fermentation, and production of yeast, ethyl alcohol, acetone-butyl alcohol, lactic acid. Experience has shown that, to be practical, a process must be capable of handling very heavy loading, should be capable of removing at least 65% of the 5-day B.O.D., and there must be a substantial recovery of values to offset a proportion of the operating charges. For processes operating aerobically, nitrogen and phosphorus nutrients must be added at the cost of hundreds of dollars a day. The

products recovered would be enormous in amounts, and there must be a market for them.

Perhaps the most promising is the production of yeast. A commercial-scale plant is in continuous operation at Rhinelander, Wis., but it is still deeply involved with mechanical processing problems not yet developed satisfactorily. Here the pulp fiber is screened out, the liquor is treated and packed at a uniform rate into a large fermentor, along with yeast nutrients and large quantities of air. The growth process requires only a few hours, and the yeast is then separated out by centrifuges and washed and passed as a heavy cream to a drum dryer, which delivers it as a dry powder. All the equipment must be of high-grade corrosion-resistant material. Indications are that the bulk of the demand for the product will be in the poultry food field, but others are definitely in sight.

J. M. Holderby and Averill J. Wiley — "Biological Treatment of Spent Liquor From the Sulfite Pulp-ling Process;" *Sewage and Industrial Wastes*, January.

Pumping Sewage Sludge

Cleveland, O., pumps sludge from its Easterly plant through 71,000 ft. of 12" pipe to the Southerly plant

for disposal. It therefore was desirable to learn the effect of solids content on head loss with various types of sludge; the maximum possible solids content that could be pumped; and the effect of thixotropic properties of sludge, due to standing, up to periods of 24 hr. These were studied by means of tests using $2\frac{1}{2}$ " iron pipe through which were pumped mixed primary and waste activated sludge, waste activated sludge, digested sludge, and digested sludge chemically conditioned and concentrated. Among the conclusions drawn were the following: Only at very low velocities can thixotrophy add to the head loss. The tendency of sludge to jell in open channels and tanks was not experienced in the pipe at low velocities, and it is believed that none except unusually thick sludges would ever jell so that a pump could not move them. At low velocities the digested and conditioned sludges show a much lower head loss than the primary sludge, the solids content being the same (as was found at the Manchester, England, sewage works). The factor of solids content and the maximum that can be pumped was not determined; in

fact, as long as sufficient velocity is available, sludge can be pumped, up to a limit of probably around 12%. At high velocities, the head loss does not differ greatly from that of water and is practically the same for all sludges. For example, at 7.0 fps the head loss of water is 6.8 ft. per 100 ft. of pipe and that of sludge ranges from 7.6 ft. to 9.0 ft.; but at 3 fps the loss with water is 1.5 ft. and that sludges from 2.25 ft. to 4.0 ft.

John R. Wolfs—"Factors Affecting Sludge Force Mains," *Sewage and Industrial Wastes*, January.

Synthetic Detergents And Sewage Treatment

Investigation has been conducted in England by Shell Chemicals on the effect of synthetic detergents on primary sedimentation, on sewage bacteria, on sludge digestion and methane production, on humus sludge, grease recovery, and effluent purity. In sewage practice, the presence of as much as 10 parts of synthetic detergent/10⁵ would be most exceptional. Below this, there is no significant effect of detergents of the Teepol type nor of the nonionic type on primary sedimentation. Detergents may cause deposits in sewers

to be taken into suspension and carried to the plant in large quantities, but this should be only temporarily troublesome and ultimately advantageous. It seems certain that detergents of the Teepol type have no bactericidal effect. This may not be true of cationic detergents but "no difficulties appear to have been experienced in this connection in the United States." Investigations at Amsterdam indicated no effect on anaerobic fermentation of Teepol at less concentration than 75 parts per 10⁵. As much of the detergent is precipitated with the primary sludge and the remainder is largely decomposed in the filters, there probably would be no effect on the settlement of humus sludge. As synthetic detergents are themselves organic and soluble in hard water, they should in most cases cause only a slight increase in the load on filters.

A. Lawrence Waddams—"Synthetic Detergents and Sewage Processing," *The Surveyor*, Jan. 20.

Elongated Septic Tanks

Most health departments require that the length-width ratio for septic tanks do not exceed 3:1. But con-

TENNESSEE CORPORATION
ferri-floc
FERRIC SULPHATE
Atlanta, Georgia

Results Count!

- MORE ECONOMICAL
- EASIER TO HANDLE
- SUPERIOR RESULTS

The use of Ferri-Floc in water supplies has several advantages over other coagulants now in use. Economy of operation is a great factor in the minds of prospective users, but, once used Ferri-Floc immediately shows its ability to produce a higher quality of water at a lower cost.

ADVANTAGES OF FERRI-FLOC

1. Coagulation is effective over a much wider pH range than with alum. Color flocs may be formed in the very acid range, where alum may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10, at even higher for the removal of turbidity and manganese.
2. The time required for floc formation, conditioning and settling is in many cases considerably shorter than that required for other coagulants.
3. Filter runs have been markedly increased in several cases.
4. Manganese is successfully removed at pH values above 9.
5. Effluents may be produced which are exceedingly low in both iron and aluminum.
6. Hydrogen sulfide is removed, and taste and odor improved.
7. Ferric floc does not seem to stick to sand grains to form mud balls, and is subject to less "breaking through" on the filters.

FREE BOOKLET - Send card or letter for free booklet on the advantages of Ferri-Floc to Tennessee Corporation, Grant Building, Atlanta, Georgia or Lockland, Ohio.



TENNESSEE CORPORATION
Atlanta, Georgia Lockland, Ohio

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

WHEN SPECIFYING CLARIFIERS FOR SEWAGE TREATMENT...

Why buy Dorr?

1 { BECAUSE Dorr Clarifier first cost is economical . . . as demonstrated by competitive bids.

2 { BECAUSE Dorr Clarifier performance is equal to or better than that of others . . . as clearly shown by extensive operating results.

3 { BECAUSE Dorr Clarifier maintenance costs are far below those of others . . . as proven by actual records from 135 Dorr units showing an average maintenance cost of \$5.91 per unit per year over a 11.4 year period.



These three points . . . low first cost, efficient performance and minimum maintenance cost . . . comprise the yardstick by which Clarifier value is measured. When you buy Dorr, you buy full measure in all three.

DORR

RESEARCH — ENGINEERING — EQUIPMENT



THE DORR COMPANY, ENGINEERS
BARRY PLACE, STAMFORD, CONN.
NEW YORK • ATLANTA • TORONTO
CHICAGO • DENVER • LOS ANGELES
RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.
SUGAR PROCESSING
PETREE & DORR DIVISION, STAMFORD, CONN.
ASSOCIATES AND REPRESENTATIVES
Dorr Technical Services and Equipment Are Also Available Through Associated Companies and Representatives in the Principal Cities of the World. Names and Addresses on Request.

When writing, we will appreciate your mentioning PUBLIC WORKS

siderable economy can be effected in constructing large septic tanks by placing in series a number of precast single-tank units. A 15-month test of two tanks, one with a length-width ratio of 2.5:1 and 48" depth, the other with seven precast units having a combined ratio of 14.5:1 and liquid depth of 39", both operating at rated capacities, showed a superior performance by the elongated tank under conditions of both uniform and surge flows, and in both the presence and absence of heavy sludge accumulations. The relative superiority is greater in the

presence of heavy sludge loadings. Limiting values for the length-width ratio and for depth are not known, but a ratio as high as 20:1 and a depth as shallow as 30" are believed to be satisfactory.

Harry F. Ludwig—"Septic Tanks: Design and Performance," *Sewage and Industrial Wastes*, January.

Operation of the Daytona Beach Process

In the Daytona Beach, Fla., plant, calcium carbonate sludge from the lime water softening plant is used as a coagulant, and flocculation, coagu-

PUBLIC WORKS for March, 1950

lation and sedimentation are all achieved in one small tank. The sludge is dewatered on vacuum filters. The results are greatly improved by the addition of 0.1 cu. ft. of air per gallon of sewage with the calcium carbonate. This, with one hour detention in the aero-accelerator, gives 60% to 65% removal of B.O.D. With 2-hour detention, 80% to 85% removal is obtainable.

Joe Williamson, Jr.—"Nine Months' Operating Results of the Daytona Beach Process," *Sewage and Industrial Wastes Engineering*, February.

Lagooning Industrial Wastes

Lagooning of waste after passage through a rotary or vibrating screen is often the only practicable method of treating canning or slaughterhouse waste in rural districts. Lagoons may be classified as either leaching or storage. Untreated storage lagoons are always a source of odor nuisance, but if treated daily with sufficient sodium nitrate they are satisfactory. Lagoons may be excavated in firm ground to an effective depth of 5 ft., with a 2' or 3' dike for freeboard and to exclude surface water. The lagoon should be sufficiently large to hold waste for at least 5 or 6 months. Winter storage of lagooned wastes has shown B.O.D. reductions far in excess of those accountable for by bacterial action at low temperature, and probably due to the exclusion of suspended and some dissolved solids by freezing.

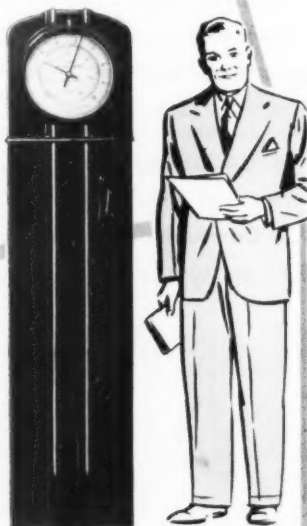
William A. Ryan—"Industrial Waste Lagoons," *Sewage and Industrial Wastes*, January.

Aeration Ponds For Cannery Wastes

After several years of pilot plant studies, the author developed a method of using ponds and biofilters for the treatment of fruit and vegetable cannery wastes, combining aeration and recirculation. It was shown that it is practicable to use ponds in place of clarifier structures for detention and settling. The ponds may be operated without nuisance due to settlement and retention of sludge therein if recirculation with concomitant reaeration is maintained at all times. When recirculation through the filter was suspended temporarily, the sludge in the ponds became septic and scum formed; but when recirculation was resumed the scum disappeared and the pond contents became aerobic. By dividing the land in three zones of sedimentation, oxidation and percolation, 6

Partners IN PLANT MANAGEMENT

Efficient plant management calls for capable personnel and good instruments. In the water works field where accurate information is essential, Builders Filter Gauges have wide acceptance. For indicating water level, sand expansion, rate of flow, or loss of head, these attractive gauges give the facts clearly and concisely—and they're ideal for keeping permanent records, as well. Easy to read and easy to look at, Builders Gauges are a credit to any water works, large or small. For engineering information and Bulletin 450-D1A, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, R. I.



Builders Filter Gauges are available in a wide variety of types for every indicating and/or recording requirement.

BUILDERS PRODUCTS

The Venturi Meter • Propellaflo and Orifice Meters • Kennison Nozzles • Venturi Filter Controllers and Gauges • Conveyaflo Meters • Type M and Flo-Watch Instruments • Wheeler Filter Bottoms • Master Controllers • Filter Operating Tables • Manometers • Chlorinizers • Chlorine Gas Feeders • Chronaflo Telemeters

BUILDERS PROVIDENCE

Instruments

mgd of straight cannery wastes has been treated on 84 acres of land. In a plant built at Modesto, Calif. the aeration is effected by a series of hydraulic jumps on an inclined plane, which requires less head than sprinkling filters would. This plant treats 50,000 to 100,000 gpm.

Harry N. Jenks—"Aeration Ponds Handle Cannery Wastes;" *Sewage and Industrial Wastes Engineering*, February.

Treating Wool Dyeing Wastes

Wool dyeing wastes are stronger than domestic sewage, but much weaker than wool scouring wastes. The volume produced per pound of wool in dyeing is considerably greater than that produced in scouring. Sedimentation and coagulation do not offer effective methods for treatment of dyeing wastes, but they can be treated satisfactorily on trickling filters, preferably after equalization, with loadings at least as great as those employed with domestic sewage. Recirculation makes heavier loadings possible. High or low pH markedly reduces filter loading and filter efficiency. The sludge is low in volume and readily disposed of. Dye wastes introduced into domestic sewage

should not present any real problem except that of added loading.

Joseph A. McCarthy—"Characteristics and Treatment of Wool Dyeing Wastes;" *Sewage and Industrial Wastes*, January.

Digesting Tannery Sludge

The sewage of Gloversville, N. Y., is combined domestic and tannery wastes. The latter are highly colored and contain a large percentage of solids, hair, pieces of leather, dirt and spent chemicals; also kerosene, solvents, grease and oils. The combined flow of sewage totals 4.5 mgd for five days a week and 2.5 mgd for two days, with a peak rate at 10 A.M. of 7 mgd. Since 1912 a treatment plant has been operated, using settling tanks, trickling filters, open sludge drying beds and intermittent sand filters. The sludge was not digested. The plant is now overloaded. Also changes in the process of tanning have changed the character of the wastes. The most difficult problem has been the disposal of the sludge, and a pilot plant to study the possibilities of digestion has been operated for several years. This study indicated that combined domestic sewage and tannery wastes can be digested effectively. It is

proposed to admit all of tannery wastes into the sewers with no pretreatment except that no solvents or oil from degreasing the leather be admitted.

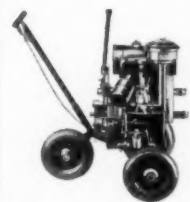
The capacity of the digestion tanks required is estimated at 305,000 cu. ft., equivalent to a population of 105,000 people. (The population in 1940 was 23,329). The requirement is multiplied by approximately 4 2/3 because of the tannery wastes. Also the difficulty is increased by the inhibiting character of the tannery wastes, the hair, occasional hide, and high color. During tests of digesting it was found that the best temperature was 95° or above, when gas was produced at a high, uniform rate.

Morell Vrooman and Virgil Ehle—"Digestion of Combined Tannery and Sewage Sludge;" *Sewage and Industrial Wastes*, January.

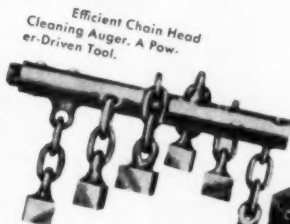
Vinyl Resin Sewer Lining

To protect concrete sewers from attack by hydrogen sulfide gas, they have been lined with tile liner plates. A weak point in this practice is the joints between the plates, which are vulnerable. There has been developed a plastic liner com-

PIPE CLEANING TOOLS FOR WATER LINES



Above: "Flexible" Power Driven Pipe Cleaning Machine. Fast, Powerful, Safe.



Application of Power Cleaning Machine and Chain Head Auger in 4" Line.



"Flexible" Carry-All Trailer, packs everything needed — Rod Reel, Steel Rods, Power Drive, etc.



Just a few minutes work for Dodge City to get at the Root of the trouble with "Flexibles."

"FLEXIBLE"

UNDERGROUND PIPE CLEANING CO.

9059 VENICE BOULEVARD, LOS ANGELES 34, CALIFORNIA

141 W. Jackson Blvd.
Chicago, Ill.
Box 167
Los Nietos, Calif.

401 Broadway
New York 13
41 Greenway St.
Hamden, Conn.

147 Hillside Ter.
Irving, N. J.
3786 Durango Ave.
Los Angeles 34, Calif.

P. O. Box 165
Atlanta
709 House Bldg.
Pittsburgh 8, Pa.

P. O. Box 465
Memphis, Tenn.
4455 S. E. 24th Ave.
Portland 2, Ore.

SEWER-ROD EQUIPMENT CO.

801 E. Excelsior Blvd.
Hepkins, Minn.
4455 S. E. 24th Ave.
Portland 2, Ore.

29 Cordon Ave.
Roslindale 31, Mass.
P. O. Box 447
Lancaster, Texas

posed of vinyl-chloride resins combined with reinforcing pigments, formed under high pressure with a minimum thickness of 0.06 in. and ribs on the back for mechanically locking it to the concrete, similar to those provided on tile liner plates. After the plates have been placed on the forms they are welded together on the back, and after the forms have been removed the joints on the inside are welded also, providing a continuous, impenetrable lining.

C. G. Munger—"Sewer Corrosion and a Plastic Answer," *American City*, February.

BIBLIOGRAPHY

American City

Sewer Corrosion and a Plastic Answer. By C. G. Munger, Amercoat Corp., February, Pp. 90-91, 167.

The Sanitary Landfill. By William S. Foster, Engineering Ed., February, Pp. 94-95.

Developments in Sewage Treatment Equipment. February, Pp. 118-119.

Civil Engineering

Potomac Valley Conservancy District Takes the Offensive Against Pollution. By Harold A. Kemp, Div. San. Eng., Dist. of Columbia, January, Pp. 33-36, 86.

Contractors Record

Synthetic Detergents and Sewage Processing. By A. Lawrence Waddams, Jan. 18, Pp. 22-28.

Engineering News-Record

Sewage Treatment Plant for a Small City. By Rollin F. MacDowell, Cons. San. Engr., Jan. 19, Pp. 46-48.

Small-Area High-Rate Filter Plant Adds Capacity, Prevents Pollution. By Frank L. Flood, Cons. Engr., Feb. 2, Pp. 37-39.

Public Works

Building a 10-Ft. Drain of Prefabricated Pipe. By R. R. Drury, Cons. Engr., February, Pp. 40-41.

Automatic Controls Assure Proper Waste Treatment. February, P. 47.

Small Sewage Treatment Plant for an Airport. By Marion Kelez, February, Pp. 54-55.

How to Make Good House Connections. February, P. 56.

How to Control Insects in Refuse Dumps. By Elton J. Hansen, Specialist in Entomology, Rutgers Univ., February, Pp. 57-58.

The Status of Garbage Collection and Disposal in Indiana. By N. W. Nester, February, Pp. 60-61.

Sewage and Industrial Wastes

Factors Affecting Sludge Filter Mains. By John R. Wolf, Asst. Engr. Ohio Health Dept., January, Pp. 1-10.

Sanitary Engineering in a Changing World. By Gordon M. Fair, Prof. of Eng., Harvard Univ., January, Pp. 11-16.

High-Rate Filtration at Liberty, N. Y. By Olney Gordon, Cons. Engr., John Lawrence, Supt. of Pub. Wks., and Harry Etchenauer, operator, January, Pp. 17-25.

Primary Standards for B.O.D. Works. By Clair N. Sawyer, Peter Gadjaz, Marysue Moore and Albert Q. Y. Tom, M. I. T., January, Pp. 26-30.

Experience With Modified Methods for B.O.D. By F. W. Mohman, E. Hurwitz, G. R. Barnett and Harry Kramer, San. Dist. of Chicago, January, Pp. 31-40.

Disposal of Sewage Effluent at Madison, Wis. By H. O. Lord, Chf. Engr., Madison, Wis., Met. Sewerage Dist., January, Pp. 41-46.

Control of Bacterial Numbers in Chlorinated Sewage Effluents. By Rolf Eliassen and Herman L. Krieger, College of Eng., New York University, January, Pp. 47-54.

Septic Tanks: Design and Performance. By Harvey F. Ludwig, Cons. Engr., January, Pp. 55-60.

Biological Treatment of Spent Liquor from the Sulfite Pulp Process. By J. M. Holderby and Atterill J. Wiley, Sulphite Pulp Mfrs. Research League, January, Pp. 61-70.

Industrial Waste Lagoons. By William A. Ryan, San. Chemist, January, Pp. 71-76.

Characteristics and Treatment of Wool Dyeing Wastes. By Joseph A. McCarthy, Lawrence

PUBLIC WORKS for March, 1950

Experiment Station, January, Pp. 77-86.

Biological Oxidation of Industrial Wastes. By H. Hukelkian, N. J. Agri. Exp. Sta. January, Pp. 87-93.

Digestion of Combined Tannery and Sewage Sludge. By Morrell Vrooman and Virgil Ehle, Cons. Engrs., January, Pp. 94-102.

Sludge Digestion Tank Heating and Related Problems. Panel Discussion by G. E. Symons, Assoc. Ed. Water & Sewage Works, January, Pp. 104-112.

Interesting Extracts from Operation Reports. By R. D. Cram, Supt. Rochester, Mich., treat. plant; Geo. Martin, Chf. Engr., Green Bay, Wis., Met. Sew. Dist., January, Pp. 114-118.

Oxygen Absorption by Trickling Filter Spray. By Walter C. Anderson, Chem. Brockton, Mass., Sew. Lab., January, Pp. 118-120.

Sewage and Industrial Wastes Engineering

Aeration Ponds Handle Cannery Wastes. By Harry N. Jenks, Cons. Engr., February, Pp. 62-64.

Sewer Use Regulated by English By-laws. By L. B. Escritt, February, Pp. 65-66, 88.

Trouble-Shooting Electrical Equipment and Controls. By Victor Greiff and Ernest W. Luft, Chf. of Elect. Design and Maint., Div. of Sewage Disp., New York City, February, Pp. 67-69.

Nine Months Operating Results of the Daytona Beach Process. By Joe Williamson, Cons. Engr., February, Pp. 70-71.

How Boston Controls Intake of Wastes Into District System. By Thomas A. Herrigan, Chf. Engr., Sew. Div., Metropolitan Dist. Com'n., February, Pp. 72-73.

Pennsylvania Sets Standards for Milk and Wastes Treatment. February, P. 73.

The Surveyor

Seasonal Change in the Composition of Refuse. By Thomas Vickers, Jan. 13, Pp. 19-20.

Synthetic Detergents and Sewage Canning. By A. Lawrence Waddams, Jan. 20, Pp. 39-40.

Scour of Sewer Inverts. By L. B. Escritt, Jan. 20, P. 41.

How to Paint a Swimming Pool

The following directions for painting a swimming pool are given in

HAUCK Presents

COMPOUND MELTING FURNACE

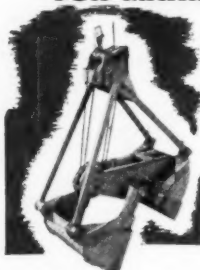


For all kinds of sewer and water pipe jointing compounds, pipe line protective enamels, asphalt, tar and pitch. Melts pot of jointing compound in 18 minutes from cold start. "Slide rail" torch burner equipment gives accurate heat control. Burns kerosene or furnace oil. Compact; built for tough service; easily portable. Built in 8, 15 and 25 gal. melting pot capacities. Write for Bulletin.

HAUCK MFG. CO.

117-127 Tenth St., Brooklyn 15, N. Y.

HOW TO REEVE THE BUCKET FOR MAXIMUM EFFICIENCY



CORRECT reeving of your bucket is essential for maximum digging efficiency and proper speed of operation. Complete instructions for proper reeving to fit every job are included in Bulletin 2230-R. You will also get a wealth of

information about lubrication, lengthening cable life, repairing worn parts and operating information that mean increased efficiency. Just ask for Bulletin 2230-R.

BLAW-KNOX DIVISION of Blaw-Knox Company

2124 Farmers Bank Bldg. • Pittsburgh 22, Pa.

BLAW-KNOX CLAMHELL BUCKETS
THE MOST COMPLETE RANGE OF SIZES AND TYPES

"Dutch Boy Painter" a publication of National Lead Co.: First wire-brush or scrape off any loose paint and spot-prime these areas with a paint consisting of 4 to 5 gallons of mixing oil and 100 lbs. of soft paste white lead. When these spots are dry, prime the entire pool with this paint and finish with an enamel specially designed for this work. The usual colors are sky blue and sea green. The surface must be thoroughly dry before painting and ample time is necessary between coats. No water should be placed in the pool until the final coat has dried hard all through.

Sanitary Fill at Rapid City, S. D.

A sanitary fill has been used by Rapid City, S. D., for the past year for disposal of garbage and rubbish. One piece of equipment is used—a bull-clam mounted on a crawler tractor. There are two tractor operators, one starting at 7 am and the other at 2 pm; and one dump manager who directs the dumping of the loads. The cell method is used. At the end of each day, the dumped material is compacted and covered with 2 ft. of packed earth. At the time this report was written, there had been insufficient experience with winter operation to determine how suitable the method will be under extremely cold weather conditions.

Water Use in St. Paul

According to the annual reports for 1947-8, St. Paul, Minn., with a population of 296,500 on the water lines, had an average daily consumption of 30.7 mgd. Unaccounted-for water amounted to 11.6%. The average use per person was 99.1 gpd; per live tap 425 gpd; and per meter 379 gpd. Domestic consumption amounted to 54.41%, and commercial consumption to 45.59%.

Cost of Collecting and Incinerating Garbage and Rubbish

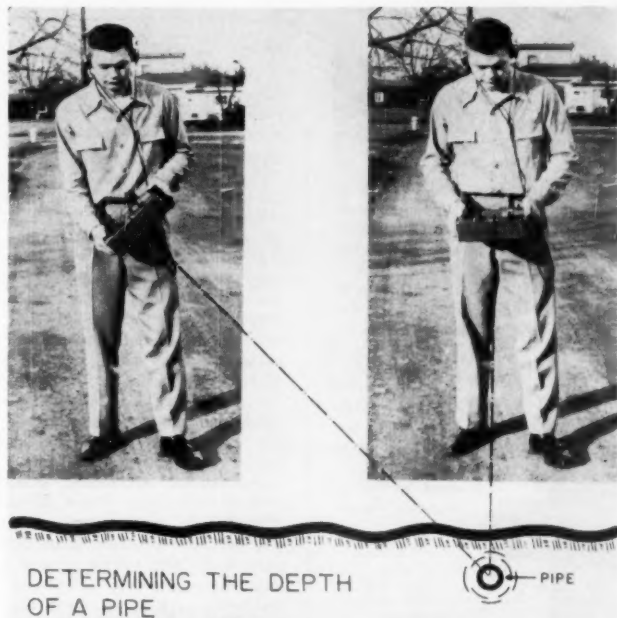
A total of 6,800 tons of garbage and refuse was collected and incinerated in Easton, Pa., during 1948. The cost of collection amounted to \$5,3395 per ton for labor and \$0.4228 for trucks, a total of \$5.7623. Incineration costs totalled \$2.099 per ton, of which \$1.426 was for handling at the incinerator, \$0.1297 was for fuel, \$0.2346 was for supervision, and \$0.3087 was for maintenance and operation.

Garbage Collections Cease; Home Grinders to be Installed

Municipal garbage collections in Jasper, Ind., will cease after Aug. 1 and the inhabitants of that city will dispose of garbage by grinding it in household disposal units and flushing it into the sewers. The city will purchase the units and resell them to the residents. It is estimated there will be a saving of \$13,000 a year in

costs of garbage collection. Refuse collections will continue. Residents who do not wish to purchase the home disposal units may dispose of garbage by methods to be approved by the Board of Health. An ordinance recently passed prohibits storage of garbage outside homes within the city limits. It is believed that this new method of disposal, by eliminating garbage cans, will reduce fly and insect prevalence.

Finding Pipes Quickly



DETERMINING THE DEPTH OF A PIPE

The principal factor in finding underground pipe structures easily and quickly is a good pipe locator. With such a locator, if one does not have even an idea of the location of the pipe, the general location can be found by walking in an arc over the area to be explored. By varying the arc, the pipe can be located in two or more places, and its line closely approximated. The pipe may then be traced by walking along this direction. A maximum signal is received when the receiver is in a vertical and parallel position over the pipe. Stubs and illegal connections may even be located in this manner without difficulty.

The exact center of the pipe may

be found by using the receiver in a horizontal position. The depth of the pipe may be determined approximately by walking with the receiver at right angles to the pipe, holding it at a 45° slant. The distance between the point where a horizontal null tone and a 45° null tone are received, indicated the depth of the pipe. For use where there is a maze of pipes, or in otherwise inaccessible places, a conductive attachment may be used for singling out individual pipes and separating them from the others.

These data are from Fisher Research Laboratory, and the illustration shows the Fisher M-Scope pipe finder.

HIGH EFFICIENCY LOW MAINTENANCE



M & H Hydrants and Valves are furnished with hub ends, flanged ends, Universal and Mechanical Joint. M & H Products are approved by the Underwriters and A. F. M. Laboratories. For water and sewerage works products, write for Catalog 34. For fire protection material, write for Catalog 40.



M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model designed to yield at the ground line under impact.

M. & H. PRODUCTS
Fire Hydrants
Gate Valves
Hydraulically operated valves
Square-bottom valves
Special Castings
Tapping Sleeves and Valves
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Valve Boxes
Sludge Shoes
Pipe Fittings
Cutting-in Tees

M & H VALVE

AND FITTINGS COMPANY
ANNISTON, ALABAMA

New EQUIPMENT SAVES MONEY for SUPERIOR

WM. J. DEEGAN,

City Manager, Superior, Wisc.

This is an abstract of a paper read by Mr. Deegan before the League of Wisconsin Municipalities.

THE city of Superior found itself, in 1947, the proud possessor of a worn out, antiquated fleet of equipment totaling some 90 pieces, with annual maintenance and operating costs far beyond its ability to support. The average age of trucks was 12 years and the average mileage exceeded 250,000 per vehicle. Public works hauling averaged approximately 23 cents per ton-mile and only a small portion of the required work was being accomplished annually. The condition of the city reflected the deficiencies in our maintenance program, for we have 42 square miles of city area to care for, containing 118 miles of paved roads and 122 miles of unpaved alleys. To permit operations within budgetary limitations required the maximum of equipment efficiency with the minimum of cost. What had caused our predicament was undeterminable. Other than normal municipal false economy and perhaps some political influence, the condition seemed to stem from a lack of appreciation of the importance of selecting equipment to fit the known operating requirements.

When the public works department requested additional equipment to facilitate catching up on the long-delayed maintenance program, we decided that now was as good a time as any to start over, rather than throw more money down the endless drain without hopes of plugging the leak. So we took a page from the book of industry and started a study by time and motion methods to determine just exactly what we were required to do annually; how much we accomplished; what it should have cost and what it actually cost; and what it would take to do the work at the proper figure. Work programming, quality and

quantity studies and cost analysis were selected as the first steps.

Since each department has its own equipment and is responsible for maintenance, we found great differences in the operating efficiency and costs of similar vehicles. Economy minded councils had restricted equipment purchases to actual needs in the past and no department owned spare pieces of equipment to use in case of breakdowns. Much of this equipment had been purchased second hand. Not always were the pieces designed for municipal operation. For instance, two 1945 trucks, originally designed as over-the-road tractor units, had been impressed into diversified municipal service, with poor and expensive results. The average truck was 1½-ton capacity with 2½-cubic yard bodies. It was like emptying the ocean with a teaspoon to handle snow and ash removal and the some 30,000 cubic yards of gravel required per year for street maintenance.

Central Motor Pool

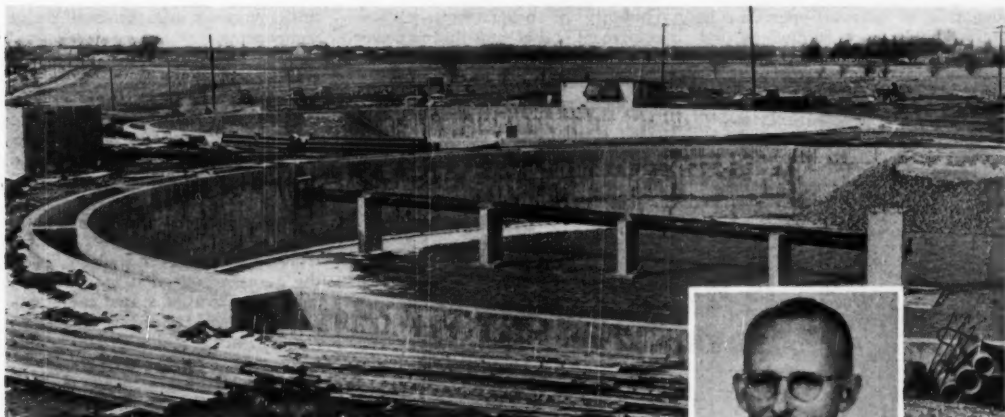
The first major step was the consolidation of all equipment into a central motor pool under the supervision of a trained equipment superintendent. This depot was provided with adequate shop and garage facilities and sufficient tools and equipment to permit protective maintenance on all equipment. All repair work is performed by the central garage with qualified city mechanics. Trucks are rented to departments on an hourly basis at a rate which will return the costs of operation, maintenance and depreciation. Annual budgets, in providing for rental of city equipment automatically insure an annual depreciation fund for replacement when indicated.

The equipment depot was established by ordinance, adopted by the council, and surplus funds in the amount of accumulated depreciation were appropriated to the reserve for replacement account. Cost accounting was instituted and stores control

TODAY'S FILTER PLANTS

• use vitrified clay
• filter bottom blocks

PLACE: **AMES, IOWA**
ENGINEER: **HOWARD R. GREEN COMPANY**



Two of three 135' dia. rock filters using Vitrified Clay Filter Bottom Blocks at Ames, Iowa.



Charles D. Mullinex
Chief Sanitary Engineer
HOWARD R. GREEN COMPANY

This excellent example of modern sewage treatment plant design was co-sponsored by the city of Ames, Iowa and Iowa State College at a cost of approximately \$1,000,000.00 to serve 27,000 population and an average dry weather sewage flow of 2.4 M.G.D.

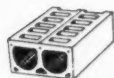
Treatment units are designed to produce a highly nitrified effluent of less than 25 p.p.m. B.O.D. because of low receiving stream flows and to meet minimum State requirements.

An important feature of this plant is the floor of vitrified clay filter bottom blocks. These blocks are specially designed with large top openings and smooth channels to give best operating results.

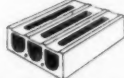
Howard R. Green Company, Cedar Rapids, Iowa, Consulting Engineers for the project, has served more than 160 midwest municipalities since 1913 in matters of water supply, water treatment, sewerage and sewage treatment. Charles D. Mullinex joined the company in 1946, after service in the San. Corps with 6th and 8th Army HQ as Sanitary Engineer in the Philippines and Japan. Prior to military service, Mr. Mullinex was Senior Sanitary Engineer with the Iowa State Department of Health for nearly 10 years.

SPECIAL FEATURES: WON'T CLOG

Bosco

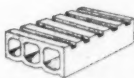


Pomona



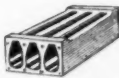
RESISTS ACIDS

Transfer



PROVED BY USE

Netco



EASY TO LAY

Dickey



Armco



TRICKLING FILTER FLOOR INSTITUTE

Write any of our members for latest engineering data

TEXAS VITRIFIED PIPE CO.
Mineral Wells, Tex.

W.S. DICKEY CLAY MFG. CO.
Kansas City 6, Mo.

AYER-McCAREL-REAGAN CLAY CO.
Brazil, Ind.

NATIONAL FIREPROOFING CORP.
Pittsburgh 12, Pa.

BOWERSTON SHALE CO.
Bowerston, Ohio

POMONA TERRA-COTTA CO.
Pomona, N. C.

When you need special information—consult READERS' SERVICE DEPT. on pages 85-89.

placed in the hands of the purchasing agent. Operating standards were adopted and records of operation established for every piece of mobile equipment except fire equipment.

Analysis of Requirements

The second major step was an analysis of our equipment requirements based on the annual public works program at the level represented by the current budget. Cost standards of private operators in similar fields were studied to find the goals we should aim at. Effort

was made through time and motion studies to ascertain how best to utilize manpower to the fullest capacity. Since labor, through negotiation, had defined our financial and other responsibilities to them, it was up to us to use their services most efficiently. They helped materially in the studies and made many valuable suggestions as to ways and means of increasing their own ability to produce more with the same effort. Studies were made of the advisability of using multi-purpose equipment and of substituting newer types of equipment for regular

duties. Typical of the findings in this regard was the decision to abandon the use of large tractors with V-plows for snow plowing and to substitute large four wheel-drive, four wheel-steer graders of equal draw-bar power, thus giving us more year-round use possibilities. The annual savings effected will pay for them in the first year. Studies were made as to standardization of equipment wherever possible to minimize inventory requirements and to permit emergency interchange of major components.

With this background of operational requirements and cost standards, the problem next was to select the proper equipment to meet these standards of flexibility and service. Since each type of equipment would make a detailed story in itself, I will illustrate the techniques employed by following through on the procedure used to select the large fleet of dump trucks and the revisions effected in the garbage collection procedure. It is in these two fields that the greatest economies resulted.

Dump Truck Selection

We had determined that we wanted medium sized dump trucks with relatively large, low bodies which could be hand loaded and which would carry the most efficient load of gravel and be big enough for economical hauling of snow, cinders and other bulky materials. We wanted a truck with sufficient wheel pull to plow snow with large mouldboards and with axles strong enough to permit axle mounting. We wanted sufficient fuel capacity to permit 24-hour continuous operation without refueling.

We wanted gear ratios which would permit the truck to operate at 95 per cent of capacity at a road speed of not in excess of 40 miles per hour, and yet which would provide a slow creeper speed to be used with spreaders and the like. By calculating the normal driving speeds from the use of tachographs we were able to determine the speed at which maximum engine efficiency would be obtained in our service. The men did not want gas tanks contained within the cabs and wanted adjustable seats. They also recommended electric windshield wipers for use during low vacuum periods of service. Heaters, defrosters, snow lights, heavy duty generators and oversize batteries were suggestions of the men. They also suggested tow hooks for the front and pintle hooks for the rear. The garage requested all-weather non-directional tires as

where
performance
counts...
count on
Centriline

86%

is worth saving!





CENTRILINE CORPORATION

A subsidiary of
Raymond Concrete Pile Co.
140 CEDAR STREET
NEW YORK 6, N. Y.

Branch Offices in all
Principal Cities of the
United States
and Latin America.



Washington, D. C. installed the equivalent of approximately 5 miles of 36" mains in various parts of its distribution system at a cost of approximately \$4.00 per foot. This was in contrast to the normal cost of around \$28.00 per foot required for new mains of this size. This economy was realized by cleaning and cement lining a group of 36" cast iron water mains thereby raising the W-H coefficient from an average of 80 to more than 140—an increase of 75% in carrying capacity.

The improvements in the operation of the system were immediate. The pressures available to the suction side of the high-service pumps constantly stayed above 20 p.s.i. after cleaning and lining, whereas they had formerly dropped to 15 p.s.i. This 5-pound increment alone had raised the discharge considerably. The total cost to the District for the cleaning and lining of these 36" mains in paved city streets, including field work, engineering, overhead and services, was \$3.92 per linear foot.

CEMENT MORTAR LININGS FOR WATER MAINS
CENTRIFUGALLY APPLIED in strict conformity with
A. W. W. A. Specifications.

standard equipment on dual rear wheels. Wheels on all large trucks were standardized as to size and studs to permit free interchange between trucks and reduce the number of spares that had to be held in reserve. The garage wanted double locking tail gates and bodies with twin cylinder heavy duty hoists to reduce maintenance costs. They also wanted double acting hoists for the big dump trucks. The garage also demanded frames of sufficient strength to eliminate frame buckling and breaking.

With these basic outlines of desirable features the next step was to design specifications upon which to base a bid call. It was here that the practice of job rating equipment came into play. At this stage the scientific application of matching equipment to the job requirement usually became a guessing contest and it was at this point where failure usually had occurred in the past selection of units.

Employment of Standards

We prepared a detailed analysis of truck application to the various types of work to be performed and selected a specification which most nearly fitted the majority of the projected uses. Eight step-by-step calculations were used which could be performed by our personnel without recourse to trained transportation engineers.

First, we broke down operating requirements to cover types of work to be done; materials to be hauled; operating conditions, including snow, ice and hills; the various loads to be carried; and the performance requirements. We wanted a truck that would carry a 15-ton gross vehicle weight up a 6% grade at 20 mph. From these data, we computed that we needed a 130-hp engine. We established that we needed a 6-yd. body of minimum height and a chassis 150 to 163 ins. long. Tires were fixed by the loading as 11:00 x 20, 12-ply, on 8-inch rims.

Load figures indicated a rear axle strength of 18,000 to 20,000 lbs., with a 2-speed axle to meet snow plowing requirements. The transmission selected was 5-speed, direct on fifth, with a ratio of about 7.5 to 1. Front axle capacity was fixed at 7,000 lbs.; front springs to carry 2,600-lb. unit loads; rear springs, 8,500 lbs. plus overloads of 1,500 lbs.; mechanical brakes; and 300-watt, 40-ampere, 6-volt, high charge at low speed, generator. Since our drivers did not want inside tanks, we equipped our trucks with two 40-gal. safety straddle tanks. Oil filters were required.

These specifications developed a

★ DIRECTORY ★ OF CONSULTING ENGINEERS

ALBRIGHT & FRIEL, Inc.

Consulting Engineers

WATER, SEWAGE & INDUSTRIAL WASTE
PROBLEMS, AIRFIELDS, REFUSE INCINERATORS & POWER PLANTS
INDUSTRIAL BUILDINGS
CITY PLANNING REPORTS
VALUATIONS LABORATORY
121 South Broad St. Philadelphia 7, Pa.

Charles B. Burdick Louis R. Howson
Donald H. Maxwell

ALVORD, BURDICK & HOWSON

Engineers

Water Works, Water Purification,
Flood Relief, Sewerage, Sewage Disposal,
Drainage, Appraisals, Power Generation
Civic Opera Building Chicago

BANISTER ENGINEERING CO.

Consulting Engineers

POWER PLANTS, WATERWORKS, CITY PLANNING, RURAL ELECTRIFICATION, SANITATION, WASTE PROBLEMS, AIRPORTS, STREET IMPROVEMENTS
1549 University Ave.
St. Paul 4, Minn.

BARKER & WHEELER

Engineers

Water Supply, Sewerage, Sewage Disposal,
Power, Public Utility and Industrial Valuations and Rates
36 State Street, Albany 7, N. Y.
11 Park Place, New York City 7

BLACK & VEATCH

Consulting Engineers

Water — Sewage — Electricity — Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
4706 Broadway Kansas City 2, Missouri

CLINTON L. BOGERT ASSOCIATES

Consulting Engineers

Clinton L. Bogert Ivan L. Bogert
J. M. M. Greig Robert A. Lincoln
Donald M. Dismars Arthur P. Ackerman
Water and Sewage Works
Refuse Disposal Industrial Wastes
Drainage Flood Control
624 Madison Ave., New York 22, N. Y.

BOWE, ALBERTSON & ASSOCIATES

Engineers

Sewerage — Sewage Treatment
Water Supply — Purification
Refuse Disposal — Analyses
Valuations — Reports — Designs
110 Williams St. 2082 Kings Highway
New York 7, N. Y. Fairfield, Conn.

BROWN ENGINEERING CO.

Consulting Engineers

Waterworks, Sewage Disposal, Airports
Street Improvements, Power Plants
Electric Distribution, Rates
K. P. BUILDING DES MOINES, IOWA

BUCK, SEIFERT AND JOST

Consulting Engineers

(FORMERLY NICHOLAS S. HILL ASSOCIATES)
Water Supply Sewage Disposal
Hydraulic Developments
Reports, Investigations, Valuations
Rates, Design, Construction — Operation
Management, Chemical and
Biological Laboratories
112 East 19th St. New York City

BURGESS & NIPLE

Consulting Engineers

Established 1908
Water supply, treatment and distribution
(Sewage and industrial waste disposal)
Investigations, reports, appraisals, rates
Airports, Municipal Engineering, Supervision
504 E. Broad Street Columbus 15, Ohio

BURNS & McDONNELL ENGINEERING CO.

Consulting Engineers — 50th Year

Waterworks—Water Purification—Sewerage
Power Plants—Steam—Diesel—Hydro
Electric Systems—Rate Reports—Valuations
Refuse & Industrial Waste Disposal
Box 7088 Country Club Station
Kansas City 2, Missouri

JAMES M. CAIRD

Assoc. Am. Soc. C. E.
Chemist and Bacteriologist

Water Analysts and Tests of Filter
Plants
Office and Laboratory
Cannon Bldg., Broadway & 2nd St.
Troy, N. Y.

CAPITOL ENGINEERING CORP.

*Engineers—Constructors
Management*

Water Works Sewage Systems
Design and Surveys Roads and Streets
Planning Airports
Bridges Dams
Executive Offices
DILLSBURG, PENNSYLVANIA

THE CHESTER ENGINEERS

Water Supply and Purification
Sewerage and Sewage Treatment
Power Developments and Applications
Investigations and Reports
Valuations and Rates

210 E. Park Way at Sandusky
Pittsburgh 12, Pa.

MICHAEL BAKER, JR., INC.

The Baker Engineers

CIVIL ENGINEERS — PLANNERS — SURVEYORS — MUNICIPAL ENGINEERS
Airport Design • Sewage Disposal Systems • Water Works Design & Operation
Consulting Services • Surveys and Maps
HOME OFFICE — ROCHESTER, PA.

Jackson — Omaha — Philadelphia — Pittsburgh — Harrisburg — Atlanta — Anchorage, Alaska

This directory is continued on page 78

<p>L. COFF <i>Consulting Engineers</i> Prestressed Concrete Structures Design Estimates, Erection Methods Supervision 198 Broadway New York 7, N. Y. Tel. Co. 7-2753</p>	<p>GREELEY & HANSEN <i>Engineers</i> Water Supply, Water Purification Sewerage, Sewage Treatment Flood Control, Drainage, Refuse Disposal 220 S. State Street, Chicago 4</p>
<p>CHAS. W. COLE & SON <i>Consulting Engineers</i> Sewerage, Sewage Treatment, Industrial Wastes, Water Supply, Water Treatment, Airports, Industrial Buildings Design and Supervision Chas. W. Cole, Sr. Chas. W. Cole, Jr. Ralph J. Bushaw M. J. McErlain Wilbur H. Garner 220 W. LaSalle South Bend, Ind.</p>	<p>HOWARD R. GREEN CO. <i>Consulting Engineers</i> DESIGN AND SUPERVISION OF MUNICIPAL DEVELOPMENTS Water Works and Treatment—Sewers and Sewage Disposal—Investigations and Valuations 208-10 Beaver Bldg., Cedar Rapids, Iowa Established 1913</p>
<p>CONSOER, TOWNSEND & ASSOCIATES Water Supply — Sewerage — Flood Control & Drainage — Bridges — Express Highways — Paving — Power Plants — Appraisals — Reports Traffic Studies — Airports 351 East Ohio Street Chicago 11, Ill.</p>	<p>JOHN J. HARTE CO. <i>Engineers</i> Waterworks, Sewerage, Treatment Plants, Gas Systems, Street and Storm Drainage, Improvements, Public Buildings, Airports ATLANTA, GEORGIA</p>
<p>OSCAR CORSON <i>Consulting Engineers</i> Sewerage Systems — Sewage & Industrial Waste Treatment — Water Supply — Drainage Airfields — Roads — Railroads Const. Surveys — Land Subdivisions Design — Supervision — Industrial Layout 902 Highland Avenue, Ambler, Pa.</p>	<p>HILL & HILL <i>Engineers</i> Sewage and Waste Disposal, Water Supply and Filtration, Dams, Reservoirs, Tunnels, Airport and Topographic Surveys Home Office: 24 E. Main St., North East, Pa.</p>
<p>DE LEUW, CATHER & COMPANY <i>Consulting Engineers</i> Public Transit, Traffic and Parking Problems Railroads Grade Separations Major Thoroughfares Expressways Subways Tunnels Power Plants Municipal Works 150 North Wacker Drive, Chicago 6, Ill. 79 McAllister St., San Francisco 2, Calif.</p>	<p>HITCHCOCK & ESTABROOK, INC. LESTER D. LEE, ASSOCIATE Consultants to Municipalities Since 1920 Water, Sewerage, Paving, Power Plants, Airports, Public Buildings, Surveys and Appraisals 248 Sheridan Road 521 Sexton Building Menominee, Michigan Minneapolis 15, Minn.</p>
<p>A. W. DOW, Inc. <i>Chemical Engineers</i> Consulting Paving Engineers Mem. Am. Inst. Ch. Engrs. Asphalt, Bitumens, Tars, Waterproofing, Paving, Engineering, Materials 801 Second Avenue New York</p>	<p>JONES, HENRY & SCHOONMAKER (Formerly Jones & Henry) <i>Consulting Sanitary Engineers</i> Water Works Sewerage and Treatment Waste Disposal Security Bldg. Toledo 4, Ohio</p>
<p>GANNETT FLEMING CORDDRY & CARPENTER, Inc. <i>Engineers</i> Water Works, Sewerage, Industrial Wastes & Garbage Disposal Roads, Airports, Bridges & Flood Control Town Planning, Appraisals, Investigations & Reports Harrisburg, Pa. Pittsburgh, Pa. Daytona Beach, Florida</p>	<p>ENGINEERING OFFICE OF CLYDE C. KENNEDY Complete Engineering Service For More Than a Quarter Century Investigations, Reports, Design, Supervision of Construction and Operation Water Supply, Water Conditioning, Sewerage, Sewage and Industrial Waste Treatment CHEMICAL AND BIOLOGICAL LABORATORY 604 Mission Street San Francisco 5</p>
<p>GILBERT ASSOCIATES, INC. <i>Engineers and Consultants</i> Power Plant Engineering Water Supply and Purification Sewage and Industrial Waste Treatment Chemical Laboratory Service New York READING, PA. Philadelphia Houston Washington</p>	<p>MORRIS KNOWLES, INC. <i>Engineers</i> Water Supply and Purification, Sewerage and Sewage Disposal, Industrial Wastes, Valuations, Laboratory, City Planning 1312 Park Building, Pittsburgh 22, Pa.</p>
<p>ROBERT AND COMPANY ASSOCIATES <i>Architects and Engineers</i> ATLANTA WATER SUPPLY • SEWAGE DISPOSAL • INCINERATORS • POWER PLANTS</p>	

well rounded utility truck which has proven singularly successful for our varied operation. The net delivered price for this vehicle of 3 to 5-ton capacity, or 23,000 pounds gross vehicle weight was \$3,521. Eight identical items were purchased. They have been operating at an average cost of seven cents per ton-mile, including depreciation. Our old fleet of 13 trucks moved some 5,800 tons of materials at the rate of 2.8 tons per trip. The new fleet moved 31,000 tons in the same period with ten trucks at the rate of 10 tons per trip. Drivers are well pleased with the ability and ease of operation.

In the field of garbage and trash removal we had formerly been using 7 trucks, including one packer body and load-getter type body. The rest were open dumps. Most crews were five-man crews except one which had two trucks with seven men. Time studies showed that, with the time lost while making the 14-mile dump run, the men worked an average of 5½ hours out of eight. The collection cycle for garbage and trash was 17 to 21 days except in the business district. In addition the public works department twice a year moved in with their heavy equipment and collected ashes which had accumulated.

In the same manner as outlined above for selection of dump trucks we conducted field and standards studies and arrived at a drastic change in operating technic. Trucks were reduced from seven to four. All 4 had packer-type bodies mounted on cab-over-engine trucks of 2½-ton nominal rated capacity but with special frames and an auxiliary trailing axle which gave them a gross vehicle weight rating of 37,000 pounds. This provided the short length required for our many "T" alleys, with ample spread of the gross load over the soft unpaved alleys and gave us equipment which two men could properly load in four hours. Since two men could handle about seven tons or 15 cubic yards per four-hour period, we could obtain a body of sufficient capacity only by the use of the packer.

Collection procedures were changed, as were the routes, and the four trucks now collect garbage, trash and ashes at the same time and are able to maintain a collection cycle of seven days. A special crew takes care of the daily commercial collections, as they did formerly. The revisions have eliminated 13 men and three trucks and greatly speeded up service. These units cost approximately \$8,000 each but with

an estimated savings of some \$30,-000 per year it will not take long to pay for them.

Another truck which resulted from our studies and which has caused quite a bit of favorable comment is a one-ton, dual-rear-wheeled pick up that has a water tight body and twin two-inch underbody hoists. This truck is used in the sewer department and the manufacturer has now added the unit to his standard equipment. Several have been sold to other cities in this area and they are as pleased with them as we are.

Final Results

With the appropriated accumulated reserve the equipment depot purchased replacements for one-third of the entire mobile fleet. Standardization was adopted and twenty trucks of the same make were in the fleet purchase. The quantity discount received because of this type of purchase totaled \$10,455 in itself. Graders, heaters, loaders, and so forth made up the other ten items of the purchase, and each of them was selected in a comparable manner to the trucks. The study took time—in fact many hours of hard study went into the entire program. It was participated in by the superintendents of the various using departments, the garage superintendent, the purchasing agent, the director of finance, a driver representative, the cost study man and myself. Each recommendation to the council was worked out thoroughly and backed up with facts and figures. Selection of the ultimate purchase was made through the majority opinion of all officials affected. Fortunately, the study proved to the council that the original purchase price had little or nothing to do with the economics of the proposed purchase. We were interested only in the produced cost per ton-mile and they agreed with us. As a consequence we now possess a well rounded flexible fleet of equipment designed specifically to fit the requirements of the job to be done. We feel the effort has been well rewarded.

Skid Resistance Better on Rubber-Containing Pavements

Tests were made on sections of highways containing powdered rubber to determine resistance to skidding. These tests were reported by T. E. Shelburne and R. L. Sheppe of the Virginia Dep't. of Highways in a paper before the Highway Re-

Industrial Waste Data— A Correction

In the article "Industrial Waste Data" which was published in October, 1949, PUBLIC WORKS, an error occurred on page 43, under the head "Milk and Creamery." In that article, it states: "Volume and strength of milk wastes per 100 pounds of milk intake. . ." The sentence should read: "Volume and strength of milk wastes per 1,000 pounds. . ." The error is regretted, and we thank A. J. Fox of the Dorr Co. for calling it to our attention.

search Board. Two series of tests were made—one immediately after construction and the other six months later. The tests made immediately after construction showed a slight superiority for the rubber-containing surface as compared to bituminous concrete and asphalt seal without rubber. The tests were made when the surface was wet. Six months after construction, the tests were repeated. On the rubber section, skid resistance was the same as found in the first test, whereas the sections without rubber showed an increased stopping distance—101.2 ft. at 40 mph as compared to 87.5 ft. for the rubber pavement. Corresponding figures for the tests made at the time of construction were 93.7 ft. for the untreated surface and 87.9 ft. for the surface containing rubber.

HAROLD M. LEWIS

Consulting Engineer—City Planner

Analyses of urban problems, master plans, zoning, parking, airports, subdivisions, redevelopment, Reports—plans—ordinances

15 Park Row New York 7, N. Y.

WM. S. LOZIER CO.

Consulting Engineers

Sewerage, Sewage Disposal, Water Supply, Water Purification, Refuse Disposal

10 Gibbs Street Rochester 4, N. Y.

METCALF & EDDY

Engineers

Water, Sewage, Drainage, Refuse and Industrial Wastes Problems, Airfields, Laboratory Valuations

Stotler Building 111 Sutter St.
Boston 16 San Francisco 4

PALMER AND BAKER, INC.

Consulting Engineers

For Problems of Transportation
Subaqueous Vehicular Tunnels
Rock Tunnels, Utility Tunnels, Bridges,
Grade Separations, Highways, Airports,
Traffic Studies, Parking Problems
Waterfront and Harbor Structures

Mobile, Alabama

BOYD E. PHELPS, INC.

Architects-Engineers

Water Supply and Purification
Sewage & Industrial Waste Treatment
Municipal Buildings
Airfields, Power Plants
Reports & Investigations

Michigan City
Indianapolis

Indiana
Indiana

MALCOLM PIRNIE ENGINEERS

Civil & Sanitary Engineers

Malcolm Pirnie Ernest W. Whittleck
Richard Hazen G. G. Werner, Jr.
Investigations, Reports, Plans
Supervision of Construction and Operations
Appraisals and Rates

25 W. 43rd St. New York 18, N. Y.

THE PITOMETER COMPANY

Engineers

Water Waste Surveys
Trunk Main Surveys
Water Distribution Studies
Water Measurements and Tests
Water Wheels, Pumps, Meters

New York 50 Church St.

RUSSELL & AXON

Consulting Engineers

Geo. S. Russell P. E. Wenger
Joe Williamson, Jr.
Water Works, Sewerage, Sewage
Disposal, Power Plants, Appraisals
408 Olive St. Municipal Airport
St. Louis 2, Mo. Daytona Beach, Fla.

SMITH & GILLESPIE

Municipal and Consulting Engineers

Water Supply, Water Purification,
Sewerage, Sewage Disposal, Drainage
Refuse Disposal, Gas Systems, Power Plants
Airports

Jacksonville Florida

STANLEY ENGINEERING COMPANY

Consulting Engineers

Airports—Drainage
Electric Power—Waterworks
Sewerage—Valuations—Rate Studies
Municipal Buildings

Horshey Building Muscatine, Ia.

ALDEN E. STILSON & ASSOCIATES

Limited

Consulting Engineers

Water Supply, Sewerage, Waste Disposal,
Mechanical, Structural

Surveys, Reports, Appraisals
209 So. High St. Columbus, Ohio

EMERSON D. WERTZ AND ASSOCIATES

Municipal Engineers

Waterworks, Drainage, Refuse Disposal,
Sewerage, Streets, Industrial Wastes

116½ East High Street, Bryon, Ohio

PUBLIC WORKS

Equipment News

Cuts Pavements and Tamps Trenches and Fills

This piece of equipment is mounted on a 1½ or 2-ton truck and will (1) cut from 1,000 to 1,500 ft. of trench 2 ft. wide through 6 inches of concrete; and (2) will tamp the trench 3 to 4 ft. deep at the rate of 1,800 to 2,000 ft. per day. In addition, it can reach to a depth of 14 ft. and compact soil in layers from 18 to 36 ins. deep, depending on soil conditions. It requires two men to operate, one to drive the truck; the other to operate the breaker or tamper. It will cut pavement to a true and neat line. After the pipe is laid, it will tamp the backfill to any desired density, so that pavement surfaces can be laid without delay—especially valuable on busy streets or highways. Saves temporary pavements, barricades and lights. For full



Pavement cutter and trench tamper.

information write RPB Corp., 2751 E. 11th St., Los Angeles 23, Calif., or use the coupon.

Use coupon on page 85; circle No. 3-1

Hole-Cleaning Gasoline Hammer Drill

On this gasoline hammer rock drill, exhaust gas is forced through the hollow drill steel to blow the



Syntron gasoline drill.

cuttings out of the hole; but for deeper holes, an extremely small auxiliary gas engine driven blower is furnished to boost the pressure. The hammer uses standard hollow

drill steels. Further information from Syntron Co., 660 Lexington Ave., Homer City, Pa., or by using the coupon.

Use coupon on page 85; circle No. 3-2

Mowing 6 Acres in 8 Hours

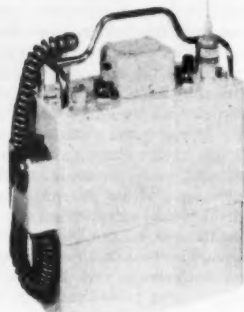
While the condition of the terrain affects the rate of mowing, this power scythe is said to be able to mow 6 acres in an 8-hour day. It is good for roadside mowing and for parks, and other municipal and county work. There are only two controls and servicing is simple. Data from Jari Products Inc., 2938 Pillsbury Ave., Minneapolis 8, Minn., or by using the coupon.

Use coupon on page 85; circle No. 3-3

Two-Way Light Weight Radio

A new FM 2-way pack radio has been developed for use by construction and maintenance organizations, fire departments, police agencies and similar work. This unit incorporates a 16-tube receiver and an 8-tube transmitter into a 19-pound radio station which can be carried by hand, or used as a semi-fixed installation. It has a tip-up loud-

speaker. It operates on either the 25-50 band or the 152-174 band. Ranges 2 to 5 miles as pack set to pack set; 7 to 10 miles from pack set to mobile unit; and greater



Motorola portable radio.

ranges under other conditions. Full data from Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.

Use coupon on page 85; circle No. 3-4

A Convertible Roller with Scalloped Rolls

To fill a wide range of needs in compacting highway fills, dams and other earth structures, a new type of compaction roller has been developed. It gives a lineal inch compaction of 5,387 pounds and will compact 4,100 sq. ft. per hour at an average speed of about 2 mph. By



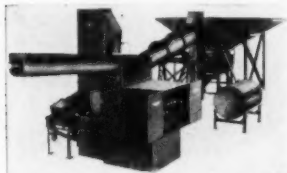
This will settle things.

replacing the scalloped compaction rolls with smooth rear rolls, the machine is converted to a standard 12-ton roller. There are five scalloped ribs at the outer circumference of the compaction rolls, each having a high point $3\frac{3}{4}$ ins. apart, and staggered. Ask for Bulletin H-140 from Huber Manufacturing Co., Marion, O., or use the coupon.

Use coupon on page 85; circle No. 3-5

Continuous Bituminous Hot-Mix Plant

A new continuous bituminous hot-mix plant has a 20-ton per hour capacity. One man controls all func-



Wayne hot-mix plant.

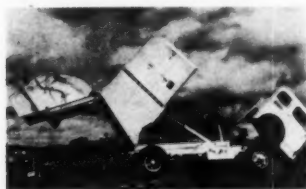
tions of the plant electrically from a single control. The plant is of the take-down type for easy movement, and when so taken down the largest piece weighs 3,000 pounds. Accurate proportioning is provided for any specified percentage. Dryer can eliminate up to 100% of the moisture in the aggregate. Complete job data and information from Wayne Crane Division, American Steel Dredge Co., Inc., Fort Wayne, Ind., or use the coupon.

Use coupon on page 85; circle No. 3-6

This Adds Efficiency to Garbage Service

The new 3000 White motor truck, with packmaster body is claimed to add efficiency, as well as sanitation, to refuse collection service. The illustration shows how the body dumps completely and cleanly; also how the power-lift cab tilts forward for better front end accessibility. More data from White Motor Co., Cleveland, Ohio, or use the coupon.

Use coupon on page 85; circle No. 3-7



Easily maintained garbage unit.



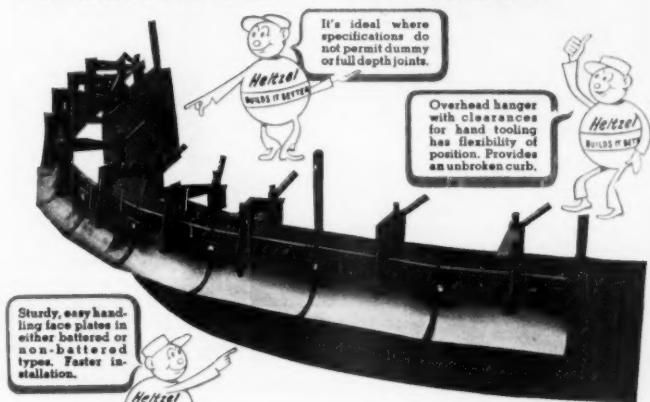
HELTZEL

SUPERIOR Forms

CURB & GUTTER

Demand for Heltzel forms comes from experienced contractors who know Heltzel forms save time and money. **TIME** — because firmer installations can be made faster. **MONEY** — because Heltzel equipment lasts longer and involves less labor on the job. The example below of a flexible form is typical of Heltzel better built forms.

- CURB FORMS & ACCESSORIES
- COMBINED CURB & GUTTER
- SIDEWALK FORMS
- RIGID RADIUS FORMS
- FLEXIBLE FORMS
- SPECIAL FORMS



Sturdy, easy handling face plates in either battered or non-battered types. Faster installation.

HELTZEL CURB and GUTTER SUPPORTS

The only flexible form with three alternate methods of support — (1) Full depth division plates, (2) Skeleton division plates, and (3) Overhead hangers. All Heltzel forms improve contractors' operations, because they speed up job while making the work easier.

PUT HELTZEL TO WORK MAKING MONEY FOR YOU

Before you buy, before you start a job — check with Heltzel! Heltzel better built curb and gutter forms in standard types will save for you. Special shapes designed by Heltzel to job specifications make difficult jobs click like run-of-mine work. Write for information now.



HELTZEL STEEL FORM & IRON CO., WARREN, O., U.S.A.

Please send information regarding:

CURB and GUTTER FORMS _____
ROAD and AIRPORT FORMS _____
BATCHING PLANTS and BINS _____

Firm _____

Address _____

City _____ State _____

Signed _____

HELTZEL

STEEL FORM & IRON CO.
WARREN, OHIO • U. S. A.

16-E Twinbatch Paver Mixer with Rubber Tires

The rubber-tire mounted Koehring 16-E twinbatch mixer is claimed to be able to mix and distribute 50



Catalog cover of 16-E paver.

cu. yds. of concrete per hour—more than the 27-E single drum mixer. With a 60-second mixing cycle, it has a capacity of 86.7 batches per hour. It has many advantages, including high mobility, and handy

automatic controls. It is described in a special folder showing production and capacity. For this, write to Koehring Co., 3026 West Concordia Ave., Milwaukee 10, Wisc., or use the coupon.

Use coupon on page 85; circle No. 3-8

Small Deepwell Turbine Pump

Designed primarily for wells 5 or 6 ins. in diameter, this new and compact deepwell turbine pump has an operating speed of only 1,750 rpm, reducing wear on both motor and



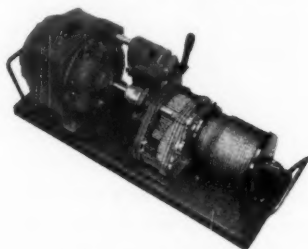
Small deep well pump.

pump. Water lubrication is provided, and drive can be direct, by right angle gear drive, or by quarter turn flat belt drive. There are four models to meet all needs. Full details from Byron Jackson Co., Pump Division, Box 2017, Los Angeles 54, Calif., or by using the coupon.

Use coupon on page 85; circle No. 3-9

Many Uses for This Portable Winch

This portable electric winch provides mobile lifting and pulling power for loading and unloading heavy materials; handling and moving pipe, hydrants and large valves;



Mobile portable winch



M-SCOPE PIPE — LOCATOR

Light Weight Model AB

Only \$149.50

Metal Cased Cabinets
Superior Performance
at Lower Cost

Pipe Finder — Leak Detector
Combination Type BL \$197.50

Free Illustrated Lit.

FISHER RESEARCH LAB., INC.

PALO ALTO

CALIF.

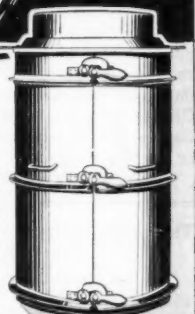
THE "Quinn Standard" FOR CONCRETE PIPE

The Quinn Standard is known as the best the world over, wherever concrete pipe is produced and used. Backed by over 35 years' service in the hands of hundreds of Quinn-educated contractors, municipal departments and pipe manufacturers who know from experience that Quinn pipe forms and Quinn mixing formulas combine to produce the finest concrete pipe at lowest cost.

QUINN HEAVY DUTY PIPE FORMS

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell and pipe at lowest cost.

WRITE TODAY. Complete information, prices, and estimates sent on request.
Also manufacture QUINN CONCRETE PIPE MACHINES



QUINN WIRE & IRON WORKS 1621 12th ST. BOONE, IA

P.F.T. Presents HIGHER SAFETY STANDARDS



GET THIS NEW BOOK

New Bulletin 221 describes the recent improvements in P.F.T. Gas Safety Equipment; for better protection for boiler rooms and other installations, and longer service life for the equipments.

All units are illustrated with detailed drawings. Specifications, typical gas piping arrangements and charts for selecting sizes are included.

P.F.T.

PACIFIC FLUSH TANK CO.
4241 RAVENSWOOD AVE., CHICAGO
NEW YORK • LOS ANGELES
SAN FRANCISCO • DENVER
CHARLOTTE, N. C. • TORONTO

Ready now

Reprints of HOW TO GET FUNDS FOR ADVANCE PLANNING OF PUBLIC WORKS

Reprints are available now of Pere Seward's valuable article on this subject that appeared in the January 1950 issue of PUBLIC WORKS Magazine.

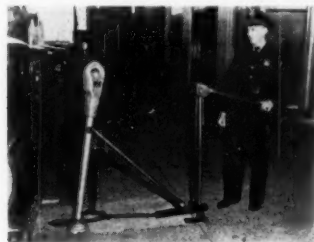
Send check for \$5 for 50 or \$8 for 100 copies to this magazine 310 East 45th St., New York 17, N. Y.

operating drag lines; operating conveyors; and providing power for cranes, hoists and derricks. Line pull up to 1,500 pounds, speeds 55 to 220 ft. per min. Write St. Anthony Machine Products Co., 2424 E. Franklin Ave., Minneapolis, Minn., or use the coupon.

Use coupon on page 85; circle No. 3-10

Lifts Most Anything and Straightens Parking Meters

Bent parking meters can be straightened easily with this tool which has a special collar and chain



Straightening a meter.

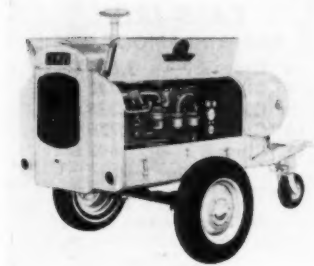
arrangement. Easy to assemble and can be used most anywhere. This "hoist-all" can also be used for a good many other jobs that formerly required a lot of muscle plus effort. For more dope on odd jobs this machine can do, write Coffing Hoist Co., Danville, Ill., or use the coupon.

Use coupon on page 85; circle No. 3-11

Liquid Cooled 105 CFM Air Compressor

There are many technical and mechanical improvements in this new 105 cfm compressor, which weighs only 1,990 pounds and operates at the low speed of 1,100 rpm. Fewer parts insure simplified service. Full information is available from Le Roi Co., 1700 South 68th St., Milwaukee 14, Wisc., or by using the coupon.

Use coupon on page 85; circle No. 3-12



105-ft. Compressor.

A Multi-Flow Rotameter

Two or more rotameter tubes can be combined in this unit to give measurements of related flows. It is used with gases or liquids, and for such services as feeds to parallel filters, continuous dilution and at other places where compactness and close correlation of related flows are desirable. Brooks Rotameter Co., Lansdale, Pa.

Use coupon on page 85; circle No. 3-13

PERSONAL NEWS

Harold E. Briley and Harry E. Wild have organized the firm of Briley, Wild & Associates, with offices at 530 N. Oleander Ave., Daytona Beach, Fla., and will engage in municipal and industrial consulting engineering. Mr. Wild has been with Russell & Axon for the past four years, and Mr. Briley for the past six years. Both have had extensive experience in engineering works of varied nature.

Hitchcock & Estabrook, Inc., consulting engineers, Lester D. Lee, Associate, of Minneapolis 15, Minn., have opened a branch office at 241 Sheridan Road, Menominee, Mich.

Joseph W. Ellms, a leader in the water purification field, and retired commissioner of sewage disposal for Cleveland, O., died on Feb. 7. His contributions to the science of water purification were remarkable, and his book on that subject is still an authority.

ASSOCIATIONS

The Maryland-Delaware Water and Sewerage Association will hold its 23rd annual meeting at the Fort Cumberland Hotel, Cumberland, Md., April 27 and 28. W. McLean Bingley, is secretary and his address is 2411 North Charles St., Baltimore 18, Md.

The New England Water Works Association will hold its annual meeting at Poland Springs, Maine, Sept. 17 to 20.

The Federation of Sewage Works Associations will meet in Washington, D. C., October 9 to 12.

The meeting of the Southwest Section, AWWA, will be held at New Orleans, La., October 15 to 18.

The California Section, AWWA, will meet in San Diego, Calif., October 25 to 28.

Now! Enjoy Big SAVINGS on Maintenance and Construction



with the **New BONDATOR!**

Own Your Own BONDATOR Process Equipment for Fast, Economical Air Placement of Concrete

Save Time, Labor, Money on...

- Lining of water reservoirs, basins, tunnels, spillways and tanks
- Restoration of viaduct, overpass, elevation and bridge disintegration
- Build-up of bridge corner posts and handrails
- Installation and repair of concrete sewer tile
- Pavement patches, sidewalk and curb repair
- Maintenance of sewage disposal plants
- Construction and repair of swimming pools, stadiums
- Repair of hatchery dams and weirs

Results of Hundreds of Users Prove BONDATOR Does a Better Job



Above photo shows repairs made by the BONDATOR process on an overpass. At left, photo shows BONDATOR in use for swimming pool construction.

BONDATOR Pays For Itself in Savings . . . Assures You

For **FREE** CATALOG Mail This Coupon **TODAY**

- Accurate high speed application of concrete and other materials
- Better hydration of cement or other binder
- Best possible "Bending Action"
- Easy operation
- Easy maintenance of equipment
- and many other outstanding advantages

Dept. C
AIR PLACEMENT EQUIPMENT COMPANY
2525 Southwest Blvd., Kansas City 8, Mo.

Send me, without obligation, full information about BONDATOR equipment.

Name.....

Firm.....

Address.....

GUNITE



Sewage Disposal Plant and Sewer Repairs The Sure Way!

Restore your facilities at minimum cost in the shortest time with the best material.

Write for our 48 page illustrated "Gunite" Bulletin—"I Tels You How."

PRESSURE CONCRETE COMPANY

"Gunite" Contractors and Engineers

193 EMMET ST., NEWARK 5, N. J.
501 COURT ST., FLORENCE, ALA.
33 NO LA SALLE ST., CHICAGO, ILL.

CONTINENTAL

FENCE



SAFETY AND PROTECTION THAT LASTS AND LASTS

No other fence provides such long-lasting protection at such low cost per year of fence life. No other fence is made of KONIK steel which contains copper, nickel and chromium for greater strength and longer life. And in addition, Continental Chain Link fence is galvanized after weaving for extra protection against rust and corrosion. For complete information on this better fence, write Continental at Kokomo, Indiana.

*Trade Marks Reg. U.S. Pat. Off.

CONTINENTAL STEEL CORPORATION

Please send FREE copy of "Planned Protection"—complete manual on proper protection.

Name _____
Address _____
City _____ State _____



CONTINENTAL
STEEL CORPORATION

INDEX OF ADVERTISEMENTS

Acker Drill Co.	89	Inflico, Inc.	51
Air Placement Equip. Co.	83	International Harvester Co.	47
Albright & Friel, Inc.	77	Irving Subway Grating Co.	22
Alis Chalmers Tractor Div.	8 & 9		
Alvord, Burdick & Hawson	77	Jaeger Machine Co.	53
Atom Mfg. Co.	64	James, Henry & Schoonmaker	78
Ayer-McCord-Reagan Clay Co.	73	Josam Mfg. Co.	52
Baker, Jr., Michael	77	Kennedy, Clyde C.	78
Bannister Engineering Co.	77	Knowles, Inc., Morris	78
Barker & Wheeler	77		
Barrett Division	63	Layne & Bowler, Inc.	59
Black & Veatch	77	Lewis, Harold M.	79
Blaw Knox Div.	77	Littelford Bros., Inc.	53
Boart Assoc., Clinton L.	77	Lock Joint Pipe Co.	18
Bowe, Albertson Assoc.	77	Lozier & Co., Wm. S.	79
Bowerston Shale Co.	75		
Bowser, Inc.	49	Mack Trucks, Inc.	91
Brown Engineering Co.	77	Maxwell & Assoc.	88
Buck, Seifert & Jost	77	McCulloch Motors Corp.	11
Buffalo-Springfield Roller Co.	4	McDonald Mfg. Co., A. Y.	6
Builders Providence	77	McWane Cast Iron Pipe Co.	79
Burns & Niagra	77	Metcalf & Eddy	88
Burns & MacDonnell Eng. Co.	77	Motorola, Inc.	16
		M & H Valve & Fitting Co.	74
Caird, James M.	77	Murdoch Mfg. & Supply Co.	90
Capital Engineering Corp.	77		
Caterpillar Tractor Co.	14 & 15	National Clay Pipe Mfrs., Inc.	21
Centriline Corp.	76	National Fire Proofing Corp.	75
Chemical Insecticide Co.	77	Navo Engine Co.	48
Chester Engineers	77		
Chicago Bridge & Iron Co.	57	Pacific Flush Tank Co.	82
Chicago Pump Co.	3	Palmer Filter Equip. Co.	87
Cleveland Trencher Co.	78	Palmer & Baker, Inc.	25
Coff, L.	78	Permutit Co.	25
Cole & San, Chas. W.	78	Phelos Inc., Bo-d E.	79
Consoer, Townsend & Assoc.	78	Pirnie Eniners, Male-im	79
Continental Steel Corp.	84	Pitometer Company	75
Corson, Oscar	78	Pomona Terra-Cotta Co.	79
		Pressure Concrete Co.	84
Darley & Co., W. S.	84	Proprietors, Inc.	56
Dalew, Cathar & Co.	26		
Deputy Brothers, Inc.	26	Quinn Wire & Iron Works	82
Dirkey Clay Mfg. Co., W. S.	75		
Dolge Co., The C. B.	64	Robert & Co.	78
Dorr Co.	78	Roberts Filter Mfg. Co.	86
Dow, A. W., Inc.	69	Roots, Connerville Blower Corp.	79
Drasser Mfg. Div.	24	Russell & Axon, Cons. Engrs.	79
Eagle Crusher Co., Inc.	62	Scott & Sons Co., O. M.	48
		Skinner Co., M. B.	86
Fisher Research Lab, Inc.	82	Smith Corp., A. O.	10
Flexible Sewer-Rod Equipment Co.	71	Smith & Gillespie	79
Foote Co., Inc.	44	Sonken-Galamba Corp.	65
Ford Motor Box Co.	50	Standard Steel Works	84
Ford Motor Co.	12	Stanley Engineering Co.	79
Frank Sae-Plows, Inc.	88	Stilson Assoc., Alden E.	79
		Superior Engine Division	13
Galion Iron Works Mfg. Co.	2		
Gannett, Fleming, Corddry &	78	Tennessee Corp.	68
Corpenier, Inc.	89	Texas Vitrified Pipe Co.	75
Globe Phone Mfg. Corp.	78	Trickling Filter Floor Institute	75
Gilbert Associates, Inc.	78		
Gould Co.	87	Universal Concrete Pipe Co.	60
Gorman Rupp Co.	54		
Grooley & Hanson	78	Wallace & Tiernan Co., Inc.	Back Cover
Green Co., Howard R.	78	Watts & Assoc., Emerson D.	17
		Walverine Tube Division	17
Harte Co., John J.	78	Wood Co., R. D.	58
Hauck Mfg. Co.	72	Worthington Pump & Machinery Corp.	23
Hellige, Inc.	90		
Holtzcl Steel Form & Iron Co.	81		
Hill & Hill	78		
Hitchcock & Estebrook	78		
Hydraulic Development Corp.	66		

MAGNETIC DIPPING NEEDLE \$17.50

with 3 section
telescoping handle
\$22.25

Write Today for
68-Page Catalog
W. S. DARLEY & CO.
Chicago 12



CAST IRON

BELL AND SPIGOT PIPE

6" Class B	— 1,635 feet
8" Class 150	— 3,792 feet
8" Class 250	— 4,328 feet
10" Class B	— 14,736 feet
12" Class B	— 602 feet

Excellent Used Condition
Immediate Delivery below mill price
Write — Wire — Phone

SONKEN-GALAMBA CORP.
2nd and Riverview (X-545) Kansas City 18,
Kansas
THatcher 9243

✓ CHECK THESE FREE CATALOGS NOW!

Mail Coupon to Order Those You Need

These helpful booklets are free. Just circle numbers you want on coupon and mail or write the manufacturer direct and mention **PUBLIC WORKS**. This service is restricted to those actually employed in public work.

NEW LISTINGS

Something Different! "Pipe Dreams" Full of Fun and Good Sense

22. The Universal Concrete Pipe Company will be glad to send you regular issues of "Pipe Dreams", their delightful pocket-size magazine full of American philosophy and good cheer. No cost or obligation. Just write Universal Concrete Pipe Company, Dept. PW, 297 South High St., Columbus 15, Ohio.

How Air Placement of Concrete Will Help on Your Jobs

56. Here's data on the hundreds of concrete jobs that can be done easier and cheaper with air placement of concrete: reservoir, tank and pool lining and all sorts of concrete maintenance are just a few of the applications. Get full details on the high speed, good bonding action, easy operation of the "Bondactor" from Air Placement Equipment Co., Dept. PW, 2525 Southwest Blvd., Kansas City 8, Mo.

New 15,000 GPH Pump Weighs Only 57 Pounds With Engine

150. Together, the 5-HP engine and 15,000 GPH (250 GPM) pump just introduced by McCulloch weigh only 57 pounds. Pump has 28-ft. suction lift; 3-in. outlet and inlet; automatic governor. Get complete information in Bulletin 4960 from McCulloch Motors Corp., Dept. PW, Los Angeles 45, Calif.

Helpful Data on Corporation Stops

161. A complete line of brass goods for water works: corporation stops, curb stops, service pipe couplings, goosenecks and other fittings are illustrated and described in catalog W-39, issued by A. Y. McDonald Mfg. Co., Dubuque, Iowa. Get your copy for ready reference.

Mack Trucks for Every Road Building Job

184. An illustrated bulletin entitled "Mack Builds the Highways of the Future" tells the story of Mack trucks on the heavy work of highway building and shows how Mack design meets the extra demands of this use. Copies available from Mack Mfg. Corp., Empire State Building, New York 17, N. Y.

Locate Mains and Services Without Digging

186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

Power Requirements On the Construction Job

191. The power requirements of excavators, compressors, electric equipment, pumps, ditchers, rollers and mobile forms are discussed in a new illustrated publication by Caterpillar Tractor Co. Specifications on a complete line of Caterpillar Diesel Engines are included. Use coupon to get a copy, or write Dept. PW, Caterpillar Tractor Co., Peoria 8, Ill.

New Hydroluxer Feeds Chemicals for Water Works

195. Small chemical dosages are accurately applied with the Hydroluxer, which features a mechanically operated inlet valve and control by a 1/2" meter set across a venturi. Used for hypochlorination, feeding coagulants and other chemicals. Bulletin from Hydroluxer Corp., 427 So. Blvd., Oak Park, Ill.

How Your Filter Washing Can Be Improved

188. More thorough sand washing with the elimination of mud balls and cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by the Palmer Filter Equipment Co., P. O. Box 1655, Erie, Pa.

Helpful Data on Distributors For Bituminous Materials

198. Two models of pressure distributors featuring uniform pressure and temperature, accurate displacement pumping are covered in Bulletins RS6145 and RS12046, available from Standard Steel Works, Dept. PW, North Kansas City, Mo.

Helps Keep Transits and Levels In Top Working Condition

189. To aid engineers in the field in adjusting and caring for levels and transits W. & L. E. Gurley have issued two pocket-sized service booklets. Causes and correction of mechanical and instrumental errors are clearly outlined. For copies of booklets write W. & L. E. Gurley, Dept. PW, Troy, N. Y.

Useful Data for Highway Builders In Barrett Road Book

190. The latest edition of "The Barrett Road Book" has 54 pages of helpful tables and step-by-step outlines of highway maintenance and construction with Tarvia and Tarvia-lithio. Tables show quantities per yard and mile, aggregate gradings; costs; many others. Get this useful book from Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

For Easy Work On Overhead Jobs

185. The "Hi-Tenner" is a crow's nest or platform carried on an articulated, truck-mounted boom for safe, easy servicing of street lights, signals and other overhead work. Hydraulic power controls platform position, reaching up 33 feet, out 20 feet. Bulletin with complete data from Maxwell & Assoc., Northern Life Tower, Seattle 1, Wash.

Installation Guide for Transite Pressure Pipe

192. A convenient, pocket-size book of 115 pages covers the whole job from receiving and handling pipe to pressure and leakage tests of finished lines. Over 100 drawings show important operations, and the text tells both how and why. Copies are available from Johns-Manville, Dept. PW, 22 E. 40th St., New York 16, N. Y.

Tractor-Mower Team Speeds Highway and Municipal Mowing

194. The John Deere Model "M1" tractor and "M1-7" mower work as a team to keep highway shoulder and municipal mowing at the economical minimum and performance maximum. Full description of the two units, and complete specifications are in Bulletin A724, available from Deere & Co., Dept. PW, Moline, Ill.

Bladeless Impeller Pumps Sewage and Trash

196. A complete description of the recently developed single passage bladeless impeller, with details of pump construction, performance curves and typical specifications are included in Bulletin APB240, issued by Fairbanks, Morse & Co., Dept. PW, 600 So. Michigan Ave., Chicago 3, Ill. Get a copy for full data on this new development.

Two-Way FM Radio Telephone Equipment for All Departments

197. The benefits of two-way radio communication for all departments of municipalities and counties make full information on this subject important to all engineers. For descriptions of Motorola FM systems, or for specific recommendations concerning your application write to Dept. PW, Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.

Chemicals for All Pest Control Work

199. Full data on dosages and methods of application of DDT, 2,4-D, BHC and other insect, weed and rodent control chemicals is available from Chemical Insecticide Co., 285 Van Brunt St., Brooklyn 31, N. Y.

CLIP AND MAIL TODAY

**READERS' SERVICE DEPT.
PUBLIC WORKS MAGAZINE
310 East 45th Street, New York 17, N. Y.**

Please send me the following literature listed in the Readers' Service Dept. of your March issue. (Circle catalogs you need.)

Booklets from Pages 85-89:

22	23	24	28	30	31	32	33	34	35	36	40	41
42	43	46	48	50	52	55	56	57	58	59	60	62
64	65	66	67	76	79	80	84	85	95	96	99	101
106	110	111	112	115	116	119	121	122	124	126	129	131
132	133	137	142	148	150	151	154	155	156	157	159	
161	164	166	168	170	176	178	182	183	184	185	186	188
189	190	191	192	193	194	195	196	197	198	199		

New Products, Pages 80-83:

3-1 3-2 3-3 3-4 3-5 3-6 3-7 3-8 3-9 3-10 3-11 3-12 3-13

Name

Occupation

Street

City State

THIS COUPON NOT GOOD AFTER APRIL 30th

FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...

SKINNER-SEAL
Bell Joint Clamp for
stopping bell and
spigot joint leaks
under pressure. Gas-
ket is completely
sealed; at bell face
by Monel Metal Seal
band—at spigot by
hard vulcanized
gasket lip.

AND BROKEN MAINS

SKINNER-SEAL
Split Coupling
Clamp. One man
can install in 5 to
15 minutes. Gasket
sealed by Monel
band. Tested to
800 lbs. line pres-
sure. A lasting re-
pair 2" to 16" incl.

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U.S.A.

Peace of Mind

Operators of Roberts-equipped
filtration plants have been tell-
ing us for years that our con-
tinuing interest in helping them
keep their plants at peak
efficiency, is a service on which
they depend—from incidental
replacement parts to million
gallon per day additions.

MECHANICAL EQUIPMENT
BY
ROBERTS FILTER MFG. CO.
DARBY, PENNA.

**ROBERTS FILTER
MANUFACTURING CO.**
640 COLUMBIA AVE., DARBY, PA.

WATER WORKS

How To Eliminate Pumping Stations With Submersible Pump Units

23. Ten big advantages of submersible deep well turbine pump and waterproof electric motor units include pump house elimination, permitting installation in park or residential areas where pump house structures would not be acceptable. Available pump types cover various heads and wide capacity ranges. Complete data in Bulletin No. 49-5200 published by Byron Jackson Co., Dept. PW, Los Angeles 54, Calif.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

Is Your City Metered 100%?

33. 100% metering as practiced by many cities requires accurate, dependable meters with interchangeable parts. Cutaway views of every part, capacity and size data are all included in handsome American-Niagara water meter booklet available from Buffalo Meter Co., 2920 Main St., Buffalo 14, N. Y.

Data on Modern, High-Rate Water Treatment Plant

40. This handsome 28-page bulletin gives a comprehensive, yet understandably written story of the development of the Accelerator, and explains its principles, advantages, design considerations, operation and applications. Helpful flow diagrams and specifications. For a copy use the coupon or write Inflico Inc., 325 W. 25th Place, Chicago 16, Ill. Ask for Bulletin 1825.

Quick Way to Locate Leaks and Pipe

57. Leak Locators. Again available to waterworks superintendents, the Globe line of leak locators, dipping needles and pipe finders. Several leaflets describing the original Geophone leak locator, Little Wonder pipe phone, and the Magnetic Dipping Needle. Globe Phone Mfg. Corp., Dept. P., Reading, Mass.

Helpful Data on Swimming Pools

59. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., 335 Josam Bldg., Cleveland 15, Ohio.

Chem-O-Feeders for Automatic Chemical Feeding

60. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation, treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioners, Inc., % Coddling St., Providence 1, R. I.

Helpful Data on Hydrants

64. Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening or using. Issued by M. & H. Valve & Fittings Co., Dept. P.W., Anniston, Ala.

Cast Iron Pipe and Fittings For Every Need

65. Cast iron pipe and fittings for water, gas, sewer and industrial service. Super-deLa-vaud centrifugally-cast and pit-cast pipe, Bell-and-spigot, U. S. Joint, flanged or flexible joints can be furnished to suit requirements. Write U. S. Pipe and Foundry Co., Dept. PW, Burlington, N. J.

Now You Can Actually See Your Chlorine Residual

79. By using the Wallace & Tiernan residual chlorine recorder you can get better chlorination control because you actually see at all times the residual being carried. The 24-hour charts provide a valuable record and check on operating irregularities. More data on what the recorder is and what it does are covered in Bulletin M-20-S. Wallace & Tiernan, Dept. PW, Newark 1, N. J.

Job Data Offered on New Steel Water Lines

80. A 12-page illustrated report listing pipe diameters, pipe wall thicknesses, line pressures, coatings, engineering personnel, etc., is entitled "A Report of Dresser-Coupled Steel Water Lines in the Year 1948." A copy will be sent by Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Handy Catalog Describes Small Hydrants, Drinking Fountains

115. This 32-page catalog describes 3/4" to 2" hydrants. Also street washers, drinking fountains and other water service devices. The Murdoch Mfg. & Supply Co., 426 Plum Street, Cincinnati 2, Ohio.

Do You Ever Have Leaks to Fix?

124. You'll want to know about the full line of "Skinner-Seal" clamps for repairing bell and socket joint leaks and broken mains. Step-by-step procedures are illustrated in catalog 41, a handsome 40-page presentation which shows applications of all fittings. Write M. B. Skinner Co., Dept. PW, South Bend 21, Ind.

The Modern Way to Filter Swimming Pool Water

129. That's the title of a bulletin full of facts about Bowers' new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bowers, Inc., Dept. PW, 1395 Creighton Ave., Ft. Wayne, Ind.

Find Buried Pipe The Golden Way

131. Finding buried pipe is easy with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 Glenlake Blvd., Glendale 1, Calif.

Data on Chlorinizer Now Available

132. Bulletin 840-F2 features the Builders Chlorinizer and shows complete details of apparatus to accurately meter chlorine gas and deliver controlled chlorine-water solution. Positive rate of flow indication, wide metering range. Get your copy of this bulletin from Builders-Providence, Inc., 16 Coddling St., Providence 1, R. I.

All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centiline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

Durable Gratings and Treads Are a Good Investment

147. Gratings for walks around settling tanks and other parts of treatment plants, both out-doors and in, for stairways, floors and balconies, are described in an illustrated 16-page bulletin by Irvine Subway Grating Co., 5053 27th St., Long Island City 1, N. Y.

Faster Pipe Laying With Precast and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precast bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

"Tailor-Made" Pumps Fit Your Requirements

156. Application-Engineered vertical turbine pumps to suit your particular pumping requirements are completely described in Bulletin P-178. Details of optional driving and pumping arrangements clearly illustrated. Get your copy from A. O. Smith Corporation, Dept. PW, Milwaukee 1, Wis.

Complete Equipment for The Complete Pool

157. Latest equipment for recirculation, filtration, chlorination, softening and pH control are described in Permitt Bulletin No. 2157. Manual and automatic valves explained and many installations diagrammed. Complete specifications given. Permitt Co., 330 West 42nd St., New York 18, N. Y.

Helpful Book Gives Pipe Flow

159. This handy 40-page pocket size book titled "Measurement of Water Flow Through Pipe Orifice with Free Discharge" explains the Layne pipe orifice meter method of computing water flow. Includes flow graphs for various size pipes. Layne & Bowler, Inc., Box 215, Hollywood Station, Memphis 8, Tenn.

What You Should Know About Meter Setting and Testing Equipment

166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

Your Property is Worth Good Protection

176. When installing link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by Continental Steel Corp., Kokomo, Ind.

POWER AND LIGHT**Air Cooled Engines for Hundreds of Applications**

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power for hundreds of applications. Get latest bulletin from Dept. FW, Briggs and Stratton Corp., Milwaukee 1, Wis.

Low Cost Power From Dual Fuel Engines

154. Operating on the Diesel cycle, burning either oil or gas, the Worthington Supercharged Dual Fuel Diesels give high economies by running on the cheapest fuel available. Get complete data from Worthington Pump & Machinery Corp., Dept. PW, Harrison, N. J.

Superior Features for Municipal Power Plants

168. Optional use of by-product gases, such as sewage sludge gas, stamina and precision construction, fuel economy and conservative rating are some of the noteworthy features of Superior Diesel Engines, described in Bulletin 4812. For a copy write The National Supply Co., Superior Engine Div., Springfield, Ohio.

Dependable Power For Every Purpose

170. Rugged Novo engines are built to handle heavy-duty loads; operate on gasoline, kerosene, gas-gasoline. Several models range from 4 HP to 32 HP. Get bulletins from Novo Engine Co., Lansing, Mich.

SEWAGE AND REFUSE**How to Keep Trenching Jobs on Schedule**

24. The easy maneuverability of the tough, compact Cleveland Model 95 "Baby Digger" makes it well suited for the difficult job of trenching past the many obstacles of city and suburban work. Multiple digging and

crawler speeds handle all soil types and trench widths up to 24". Get Bulletin S-32 from Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

How to Lower Costs Of Refuse Collection

35. For saving trucks, labor and time in city rubbish collection get details of the new Dumpster-Kolektor described in literature just published by Dempster Bros., Inc., 996 Higgins, Knoxville 17, Tenn.

Packaged Sewage Treatment—Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Solve Corrosion Problems With This Special Alloy

41. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

Design Details for Sludge Collectors

42. Booklet No. P.W. 1982 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

Ask for This Design Data On Sprinkling Filters

43. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., Dept. P.W., 4241 Ravenswood Ave., Chicago 13, Ill.

One Man Gang

GOLDAK model 87

Featherweight

PIPE LOCATOR

Only the Goldak Model 87 offers these BIG features:

PENTODE TUBES: These tubes have biased voltage which makes possible sharply defined separation of closely spaced pipes.

MICROTUNING: The metal handle is quickly and rigidly locked for perfect electronic balancing.

APPROVED LICENSE: The Goldak Company manufactures the only Pipe Locator licensed by Western Electric, added assurance of better performance.

• EXACT location of buried pipes, mains, gates, tees, etc. • Total weight, 11 lbs.—one man operation! • Strong, positive location signal. • Standard miniature radio tubes and flashlight batteries. • Lasts a lifetime—guaranteed performance.

Write for FREE literature.

The GOLDAK Company

1545 W. GLENOAKS BLVD., GLENDALE 1, CALIF.

increase filter capacity . . .

without

Expensive Plant Additions

install

PALMER FILTER BED AGITATORS

change to

ANTHRAFIL FILTER MEDIA

Hundreds of repeat orders from satisfied customers prove that longer runs at higher rates with less wash water consumption are absolute facts, not claims.

Try Agitators and Anthrafil in one Filter and you too will eventually equip your entire plant.

For Information Call or Write

PALMER FILTER EQUIPMENT COMPANY

822 E. 8TH ST. — ERIE, PA.

PHONE 5-3416

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new Sewe Rodek and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Sewage Plant Gas Storage Facilities

42. General information on estimating figures on Hortonapheres to store surplus gas produced in digesters at sewage disposal plants supplied by Chicago Bridge & Iron Company, 2115 McCormick Bldg., Chicago 4, Ill. Hortonapheres are built in sizes up to 65 ft. diameter for pressures as high as 60 pounds per sq. in. for storage at sewage plants utilizing digester gas.

Glazed Clay Blocks for Trickling Filter Underdrains

66. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

Standard Forms for Concrete Pipe

67. Concrete pipe for sewerage, drainage and culvert projects can be produced quickly and uniformly with Quinn Standard concrete forms. Data on forms for 12" to 84" tongue and groove or bell end reinforced pipe from Quinn Wire and Iron Works, 1621 12th St., Boone, Iowa.

Complete Catalog for Engineers Shows Sewage Plant Equipment

110. A complete, 44-page catalog gives engineering data on Jeffrey equipment for water, sewage and industrial waste treatment plants including screening, screenings grinder-grit collectors and washers, settling tank collectors, feeders, flocculators, mixers and other mechanical equipment. Use coupon to get Catalog 775-A. Jeffrey Mfg. Co., Columbus 16, Ohio.

How to Beat the Weed Problem

85. Be sure to investigate weed control with selective chemical weed killers. Ask for bulletins on Dodge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dodge Co., Dept. PW, Westport, Conn.

Useful Design Data on Sedimentation Tanks

99. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, Dept. P.W., Barry Pl., Stamford, Conn.

How to Improve Coagulation and Sludge Conditioning

111. "Ferri-Floc," description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

Get This Data for Your Laboratory

119. "Water and Sewage Analysis," a 32-page booklet, describes and illustrates equipment for making convenient and accurate water and sewage analyses, including comparators, aqua testers and turbidimeters. Hellige, Inc., 3718 Northern Blvd., Long Island City 1, N. Y.

What You Should Know About Filter Underdrains

155. Specifications and construction details for the use of "Bosco" trickling filter floor underdrain blocks are available in literature published by Bowerston Shale Co., Bowerston, Ohio. Information on special fittings and angle blocks also included in 12-page booklet.

The Vacuum Filter In Your Home Town

182. That is the title of bulletin F-2005 issued by The Eimco Corp. Data on dewatering sewage sludge by actual installations are included. Write Eimco Corp., Salt Lake City 8, Utah.

Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Koots-Connersville Blower Corp., 310 Poplar Ave., Connersville, Ind.

Attractive Glass Enclosures For Sludge Drying Beds

164. Complete design details on American-Moninger glass sludge-bed enclosures are included in bulletin GE-31 issued by the American-Moninger Greenhouse Mfg. Co., 1820 Flushing Ave., Brooklyn, N. Y. This 24-page bulletin also shows a number of typical installations and furnishes complete specifications on construction details.

STREETS AND HIGHWAYS

New Unit Cleans Catch Basins in a Jiffy

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Latest Maintenance Equipment for Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments, roll heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Improved Special Rollers Help Cities and Counties

84. Road and street widening are speeded up with Buffalo-Springfield trench rollers of improved design. Many other special compacting

McWane's BELL & SPIGOT

CAST IRON PIPE

Easy

- To CUT
- To TAP
- To LAY

It is corrosion resistant cast iron. Made to the rigid Standard Class 150 Federal Specifications — 500 pound test.

18 ft. Lengths

ALL SIZES 2" thru 12"

McWANE CAST IRON PIPE CO.
Birmingham 2, Alabama



"Hi-Tender," Hydraulic-powered, steel boom, controlled at cage . . . mounts on 1-ton or larger truck. Mfg'd, pat. app'd for, Stemm Bros., Leavenworth, Wn.

MAXWELL & ASSOC.

Exclusive Nat'l Distributors

1224 Dixwell Ave.
Hamden 14, Conn.
No. Life Tower
Seattle 1, Wn.



COMPARE!
GET FULL
DETAILS
NOW!

FRANK SNO-PLOWS

FRANK SNO-PLOWS, INC.
CLAYTON 1000 Islands NEW YORK

DAVENPORT-BESLER CORP.
DAVENPORT, IOWA

FRANK SNO-PLOWS OF CAN. LTD.
TORONTO, ONT.

problems handled by the portable KT-6 model. Get engineering specifications in bulletins TR-3B and KT-6 from Buffalo-Springfield Roller Co., Springfield, Ohio.

"A Decade of Duralastic Air-Entraining Cement"

121. This is the title of an illustrated booklet which tells the development of Portland Air-Entraining Cement from its initial use ten years ago to its present acceptance by highway engineers. Get a copy by using coupon or write Atlas Cement Co., Dept. PW, Chrysler Bldg., New York 17, N. Y.

How to Speed Curb and Gutter Work

126. Here's a 24-page bulletin illustrating form set-ups for every type of curb and gutter work. Send for Bulletin 225 and learn how to speed up the job with Blaw-Knox Steel Street Forms. Write Blaw-Knox, Dept. PW, Farmers Bank Bldg., Pittsburgh 22, Pa.

Versatile Maintainer Has Year 'Round Usefulness

151. A new bulletin shows how the sturdy Huber Maintainer will work for you the year round on maintenance jobs, berm leveling, road planning, bulldozing, snow plowing, brooming, mowing shoulders and as a patch roller. Good ideas on how to do all these jobs in Bulletin No. M-138. Write Huber Manufacturing Co., Dept. PW, Marion, Ohio.

Complete Bulletin on Municipal Supplies

178. Everything from leak locators to street signs is listed in the big bulletin on "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included in this handy booklet. Get a copy for ready references on all municipal supplies from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill.

Data on All Types of Bins and Batching Plants

183. Good illustrations and useful data on all types of Heltzel Highway Bins, for truck mixer charging, bulk cement plants, enclosed bucket elevators, belt conveyors, etc. Heltzel Steel Form & Iron Co., Dept. PW, Warren, O.

How to Get Good Grass for Roadside Shoulders

193. For every step in lawn care and seasonal maintenance hints he sure to read "Lawn Care," an interesting periodical sent without obligation by O. M. Scott & Sons Co., 80 Spring St., Marysville, Ohio.

CONSTRUCTION EQUIPMENT

Solve Your Drainage Problems This Easy, Permanent Way

28. Useful new 60 page catalog on standard corrugated pipe, multi-plate pipe and arches and 18 other drainage and related products for culverts, sewers, sub-drains, flood control, airports, water supply and other types of construction. Ask for "Armo Products for Engineering Construction," Armo Drainage and Metal Products, Inc., Dept. PW, Middletown, Ohio.

Methods of Installing Steel Sheet Piling

30. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Cor-Plate Piling Co., Dept. PW, 2535 S. State St., Chicago 16, Ill.

Speed Your Work With These Powerful Motor Graders

48. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

How the Versatile "Payloador" Can Speed Public Works Jobs

32. The endless number of material handling jobs facing Highway and Public Works Departments require the best in modern machinery. Carrying dirt and backfill, loading snow, grading and bulldozing are a few of the many applications of Hough Payloadors shown in Bulletins 172 and 173. Get copies from Frank G. Hough Co., Dept. PW, Libertyville, Ill.

How to Keep Your Loader On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Galion, Ohio.

Municipalities Make Equipment Dollars Go Further

53. Be sure to get your copy of "Saving Facts" a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 12, Ohio.

Data and Pictures of Complete Line of New Ford Trucks

58. Check this number on the coupon for colorful circular showing new Ford Trucks for every hauling need, available in great variety of standard, factory-built chassis and body combinations. Be sure to check these trucks on your job. Trucks and Fleet Sales Dept., Ford Motor Co., Dearborn, Mich.

Tractors for Counties, Cities and Contractors

76. An attractive 24-page catalog portrays the Allis-Chalmers HD-5 crawler's abundant capacity and ability to meet the variable needs of counties, townships and contractors. Photographs and cutaway views illustrate its rugged construction and simplified maintenance. Use coupon or write Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wis.

52-Page Data-Packed Bulletin On Contractors' Pumps

95. Tables for pump size determination on every excavation job, pipe friction loss, attitude effects and lots of other valuable data are included in this comprehensive booklet illustrating the many Jaeger "sure-prime" pump applications. Get your copy (catalog P45) by checking out coupon or writing the Jaeger Machine Co., Dept. PW, Columbus 16, Ohio.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Special Pumps to Fit Any Dewatering Job

101. Centrifugal Pumps. Long lasting, self-priming, non-clogging pumps for quickly dewatering trenches and similar construction jobs. Ask for Bulletin 7-LW-13. Gorman-Rupp Co., 320 No. Bowman St., Mansfield, Ohio.

The Right Tractor For Your Job

116. Whether you need a front-end loader, snow plow, bulldozer, sweeper or mower, International wheel tractors combine correctly with allied equipment to do the job. Your choice of gasoline or diesel units is illustrated in Bulletin A-103JJ. International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

Heating, Thawing and Melting With Hauck Burner Equipment

142. A newly released 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. A useful addition to your reference file. Get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

USE THE GEOPHONE

Registered in U. S. Patent Office

TO LOCATE LEAKS WITHOUT DIGGING!



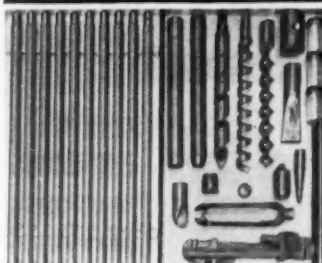
Used by America's foremost water systems, government and industrial plants. Picks up vibrations from escaping water or steam at 50 feet. Also used successfully in oil, mining, and termite fields. Complete outfit of two Geophone discs, headpiece, connecting tubes, and carrying case. **\$85**

Pipe Phones (AquaPhone)... **\$3.70**

Globe Phone Mfg. Corp.

Manufacturers of Geophones Since 1918
DEPT. P READING, MASS.

SOIL SAMPLING KIT



• 12 soil and earth sampling tools in handy steel box.

• Can be carried in any automobile.

30 years experience has proved these tools will recover accurate samples from practically all earth materials.

• MANY USES—brick and clay materials—foundation test borings—gold bearing sands—kaolin and clay for ceramics—sand and gravel pits—sub-grade testing for highways and airfield runways—base materials.

• Send for Bulletin 26-PW •

ACKER DRILL CO., INC.
SCRANTON 3, PA.

FIGHT!

Fight water wastage and consequent monetary losses.

Specify **MURDOCK** self-closing Hydrants. **MURDOCK** Outdoor Drinking Fountains are pedal-operated.

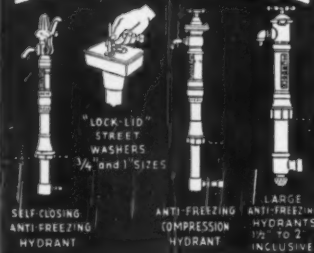
MURDOCK Hase Boxes have lids that lock trouble out.



They pay for themselves over and over again during their long life in the water they save.

The Murdock Mfg. & Supply Co.
Cincinnati 2, Ohio

MURDOCK



FOR BETTER

pH Control

and **WATER TESTS**

there is nothing like

**NON-FADING
GLASS COLOR
STANDARDS**



Pocket
Comparator
No. 605

Permanent reliability of Hellige Glass Color Standards, accuracy of color comparison, simplicity of technique, and compactness of the apparatus are exclusive features of Hellige Comparators.

WRITE FOR BULLETIN No. 602

HELLIGE

INCORPORATED
3710 NORTHERN BLVD. LONG ISLAND CITY 1, N.Y.
HEADQUARTERS FOR COLORIMETRIC APPARATUS

WORTH TELLING . . . By Arthur K. Akers



Left to right: Messrs. Seaver, Hamernik, Loud, Winberg and Hayes.

Here is a group of **Federal Motor Truck** executives deciding (among other things) that **PUBLIC WORKS Magazine** is a good place to advertise to the public works market. We are equally happy about it all!

Municipal Service Company of Kansas City, inactive since 1942, returns to the water and sewerage field in manufacture and installation of equipment.



Mr. Cuneo



Mr. King

J. A. Cuneo is transferred from Los Angeles to Chicago as manager of that **Fairbanks-Morse** branch. **A. M. McLaren** succeeds him in Los Angeles. **John S. King** of Chicago will now manage the Cincinnati branch.

Yeomans Brothers, Chicago, have appointed **Spaulding A. Norris**, of Detroit, assistant sales manager, pump division.



Mr. Lewin



Mr. Norris

Fred E. Lewin is promoted to executive vice president and general manager of the **Ralph B. Carter**

Company, Hackensack, N. J. He has been in the past fifteen years pump division sales manager and later vice president, sales. Additional **Carter** distributors are **Harry J. Glass and Associates**, Denver; **Puomat Company**, Chicago.

Below you see the steel work rising on **Dresser Manufacturing Division** of **Dresser Industries'** new plant



New Dresser plant.

expansion at Bradford, Pa.—a far cry from their first wooden building, erected in 1880.

Harry D. McPeak is the new sales manager of **City Tank Corporation**, Corona, N. Y., makers of **Roto-Pac** garbage and refuse bodies.

H. K. Eschenbrenner, president of **Universal Concrete Pipe Company**, of Columbus, Ohio, announces: 1) a new concrete pipe plant at Tampa, Fla., to serve the whole Gulf Coast; 2) **C. Ray Wilhelm** is southeastern manager, Atlanta.

Worthington Pump and Machinery Corporation tells us that **Harry E. Lewis** is promoted to assistant comptroller at Harrison, N. J., from Holyoke Works. **K. W. Horsman** becomes works manager at the Dunellen, N. J., plant. **A. M. Boehm** is now eastern manager of the engine division, headquartered in New York and succeeding **W. L. Russell**, transferred to Canadian company.



Mr. Boehm



Mr. Horsman

If you are **PAYING** for a Mack *Why not own one?*



Be Profit-Wise
Modernize with



Mack Trucks, Inc., Empire State Building, New York 1,
New York. Factories at Allentown, Pa.; Plainfield, N. J.;
New Brunswick, N. J.; Long Island City, N. Y. Factory
branches and distributors in all principal cities for
service and parts. In Canada: Mack Trucks of Canada, Ltd.

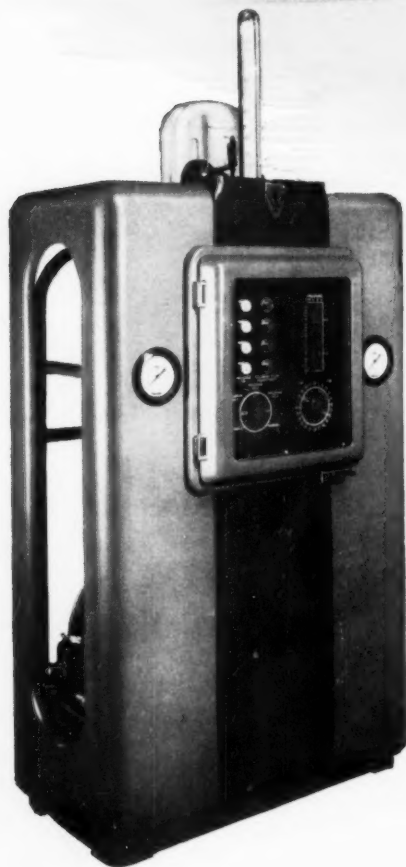
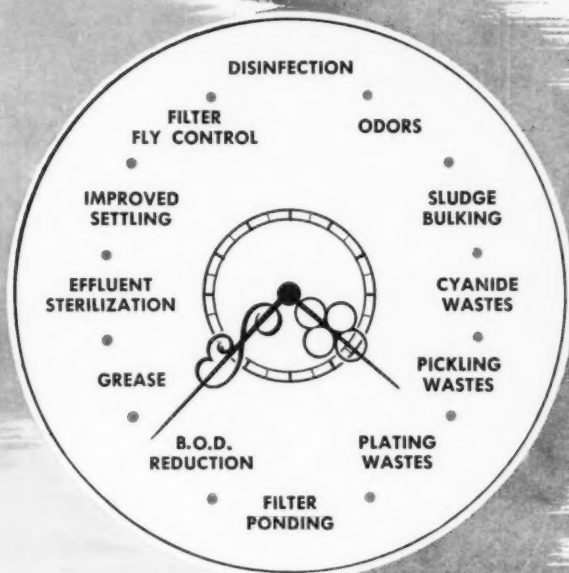
When you use a truck that doesn't measure up to its
job, you pay for Mack performance . . . *but you don't get it.*

You make a slightly higher initial investment when you
buy a Mack, but *you save a lot more* by eliminating
expensive repair bills . . . loss of earning power . . . costly
road failures . . . untimely truck replacement.

Today your dollar buys more in a Mack truck than ever
before. Measured in terms of enduring reliability; sustained
earning power; longer mileage life; lower ton-mile cost—
every Mack is a real bargain in profitable hauling.

See your nearest Mack branch or distributor. You'll
find that, all things considered, the question is—
can you afford *not* to own a Mack.

It's always time for CHLORINATION



W&T SEWAGE CHLORINATOR

Chlorination time at a modern sewage treatment plant knows no hour or season — it's always the right time to use this versatile tool in the solution of the numerous problems the average operator faces every day. For example, chlorination *controls odors* at Fort Wayne, Indiana; *reduces filter ponding* at Rotterdam, New York; and *sterilizes the effluent* of the Easterly Sewage Plant at Cleveland, Ohio.

Best of all, the advantages of chlorination aren't expensive. The average installation represents less than 1% of total plant cost.

Why not make it "chlorination time" in your plant now. Call your nearest W&T Representative for the benefit of over 35 years' experience in chlorination, a full line of equipment for every sewage plant need, the practical knowledge gained in making thousands of installations, and the availability of a nationwide service staff.

S-50

WALLACE & TIERNAN
COMPANY, INC.

CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES